



Volume 3 Number 16

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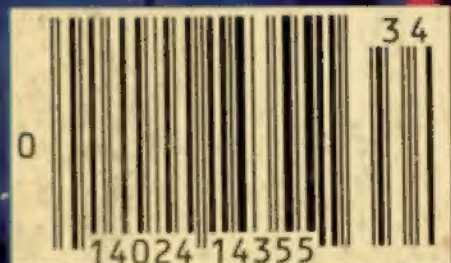
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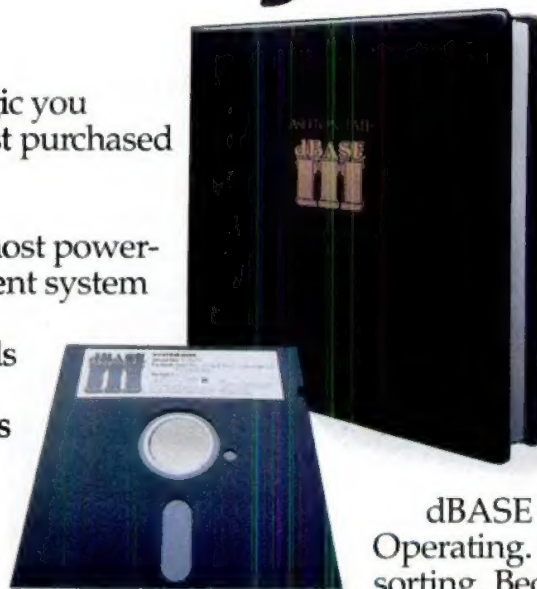
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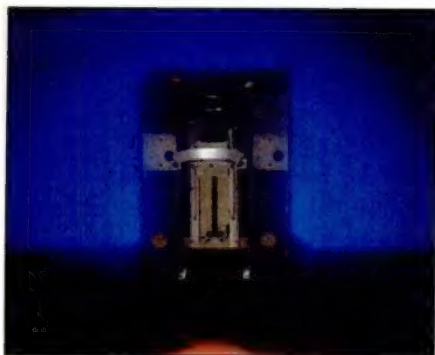


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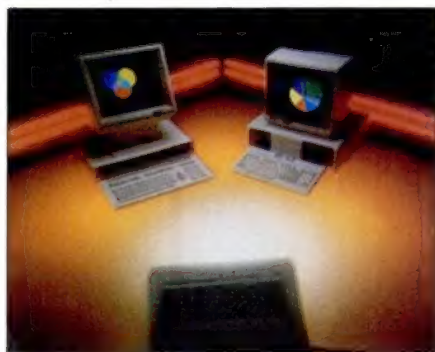


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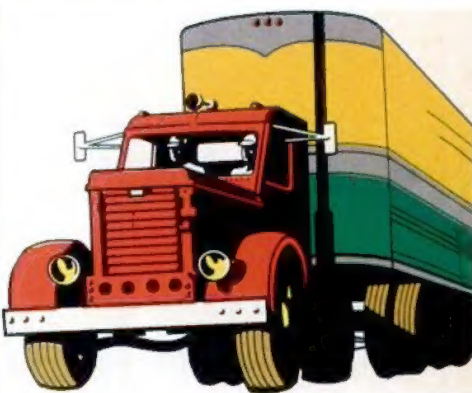
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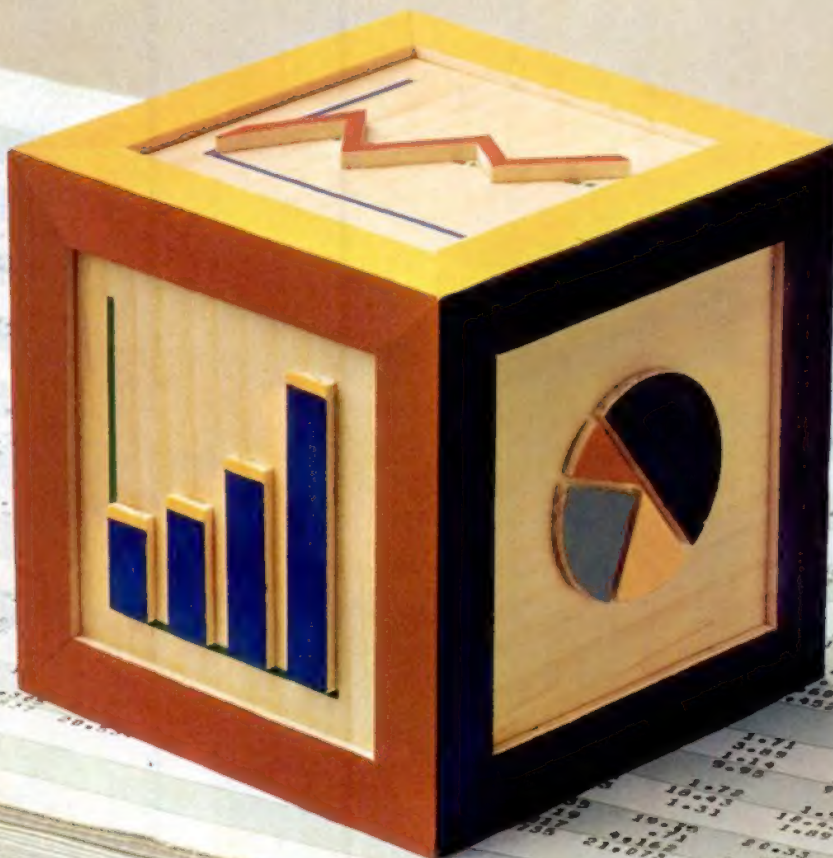
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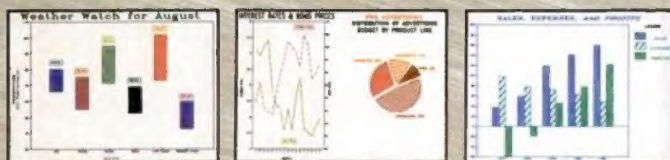
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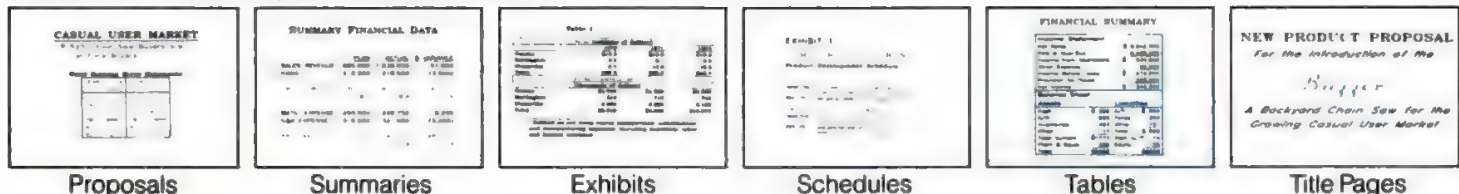
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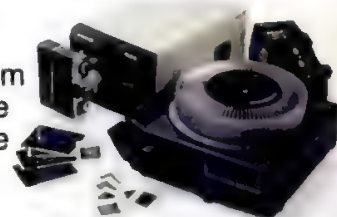
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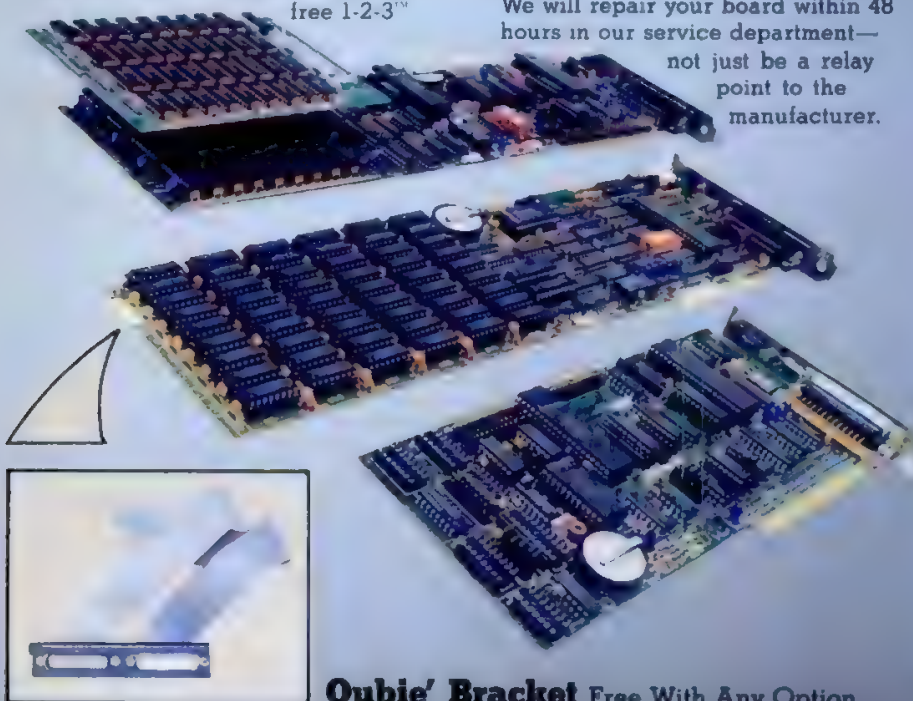

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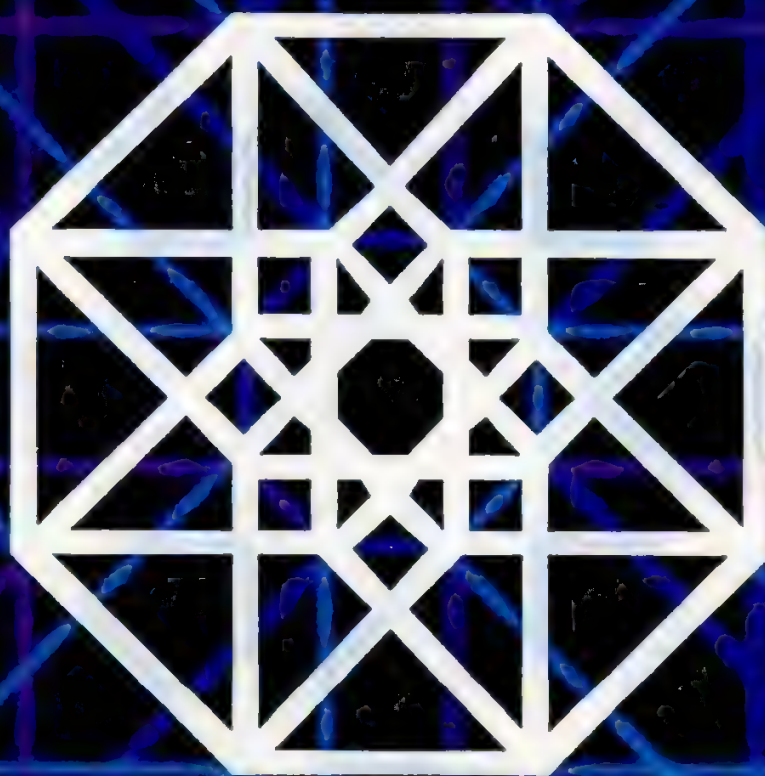
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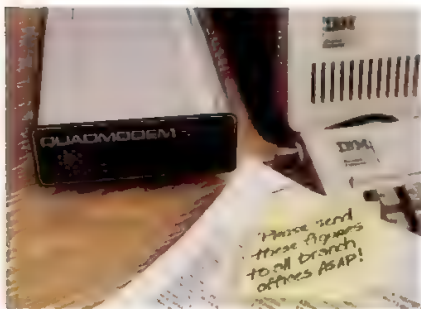
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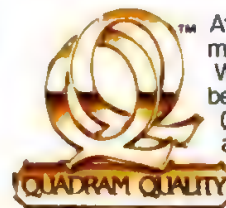
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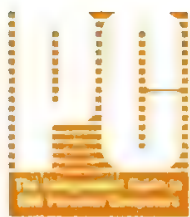
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CIRCLE 219 ON READER SERVICE CARD



What's Inside

The cast of characters who contributed to this issue includes a Brooklynite, a process control whiz, a British guy, and two robots named HERO and BOB.

Let's get one thing straight. Just because *PC Magazine* features all these top-notch writers and literate, intelligent articles, you may have the impression that the editor who writes this column talks like a combination of Bill Buckley and Alistair Cooke. I got news for you. You're dead wrong.

Sometimes I get real tired of calling people on the phone and hearing them say, "Hey, you don't talk the same way you write!" So to set the record straight, this column is going to be written in good old Kings County (that's Brooklyn to all you out-of-towners) English.

To begin with, let's talk robot. These guys at *PC Magazine*, they seem to think that there is something awesome about what's been happening lately with robots, process control, and the IBM Personal Computer. They figure that being able to run a robot—or factory, or a laboratory—without having to deal with some pretty heavy hardware is something to let people in on.

I mean, let's look at IBM itself. *PC* shipped associate editor Barbara Krasnoff down to Boca Raton, Florida, in weather that would wilt a cactus so that she could take a gander at their Robotic Assembly Insitute. They got some cute little numbers there—the IBM 7535, 7540, and 7545—that can grab hold of a whatsit, check it out for problems, and



then place it somewhere else quicker than you can say "intelligent automation." And what teaches those mechanical marvels how to do what they do so well? A little two-disk drive PC, that's what. And as long as she was down there, Krasnoff looked in on a factory that was actually making PCs—and using other PCs to make sure that everything was kosher.

While Krasnoff was taking a stroll around the assembly line, Jan Young, who's a whiz at things like process control, wandered into a little gathering called Control Expo '84, where a bunch of industry types were showing off their latest wares. He got a real good look at a

bruiser of a PC-XT that's been specially made to hold up to whatever a factory can throw at it and then some.

Writer Mike Muskal was fooling around with those highbrow scientists who spend their time messing around with molecules and other nasty little things. He'd heard tell of this software package called *LABTECH NOTEBOOK* that does for scientists what the above-mentioned PC does for factory managers—namely, it does process control.

In fact, free-lance writer Robin Raskin actually got hold of one of these high-class thinkers, a man named Bruce Merrifield, the John D. Rockefeller, Jr., Professor of Chemistry who uses his PC to do his control processing way out at Rockefeller University. I figure if somebody with that much brainpower uses a microcomputer to do his dirty work, there must be something to all this process control stuff; am I right?

Well, I thought those *PC* people were getting a little too intellectual for my tastes. Man, was I ever wrong! They've now got these machines called personal robots—sort of like personal computers, except they have wheels—and two of them are what they call "compatible" with your everyday PC.

One of them, called HERO, has been making technofreaks happy for a couple of years now, letting them get into its

WHAT'S INSIDE

innards and make it roll over and play dead. *PC Magazine* got hold of this writer named Goodlet who let on that he could make HERO do all kinds of neat

tricks, using his PC and Lotus' 1-2-3. The *PC* crew called his hand, and Goodlet gave us an article explaining just how he did it.

Meanwhile, this British guy named Robin Webster put in his two cents. He went down to San Jose, California, to get the low-down on a new home robot named BOB. Now, the Androbot people who put BOB together are spreading the news that their robot is the first real, we're-not-talking-toys-here home robot. This wouldn't have excited *PC* in the least, except that the computer that BOB is using for brains is the same one that makes the IBM PC tick. So Webster went over to Androbot and found out the deal on the droid.

Now, the people here at *PC Magazine* are pretty tough cookies, and throwing two little guys like HERO and BOB against each other wasn't enough for them. So they took a look around and saw that there were two new microcomputers on the market that were giving out some big talk about being as good or better than the PC: the Tandy 2000 and the Monroe 2000. Well, they put those two babies in the ring, got writer Alfred Poor to officiate, and let them slug it out. Poor got a decision just in time for this issue.

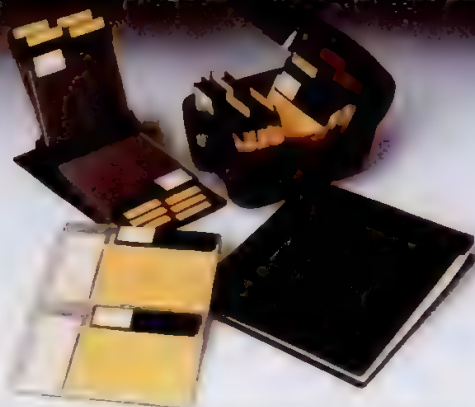
And talk about looking for punishment—this issue's got Part 6 of that gigantic "Project: Database" that everybody's gabbing about. This time around, we got the rest of your Category 3: the databases that have procedural languages.

Associate editor Stephanie Stallings, who's been keeping tabs on all these packages, let out that reviewing the databases was "a challenge for our writers." Now, Stallings is a soft-spoken, polite sort of editor, so when she uses a word like *challenge*, you know that those writers had to do some real work.

The boys in this particular ball club are real hard-hitters: *Condor 3*, *MAG/base III*, *RL-1 DATABASE*, *OPTIMUM*, *Day One*, and finally *dbase II*, the player that threw out the first pitch and gave all the others something to aim for.

In other words, this issue of *PC Magazine*'s got some real interesting stuff. You think I'm talking up my sleeve? All you gotta do is turn the page. ■

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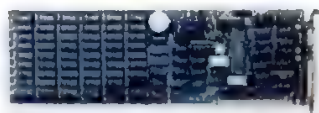
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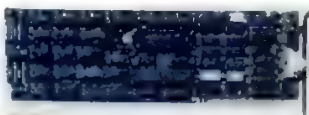
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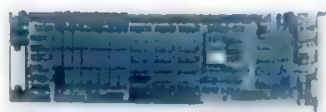
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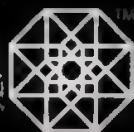


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Speaker to monitor call progress	Yes	Yes
Attractive, compact aluminum case	Yes	Yes
Two built-in phone connectors	Yes	No
Compatible with The Source and Dow Jones News Retrieval	Yes	Yes
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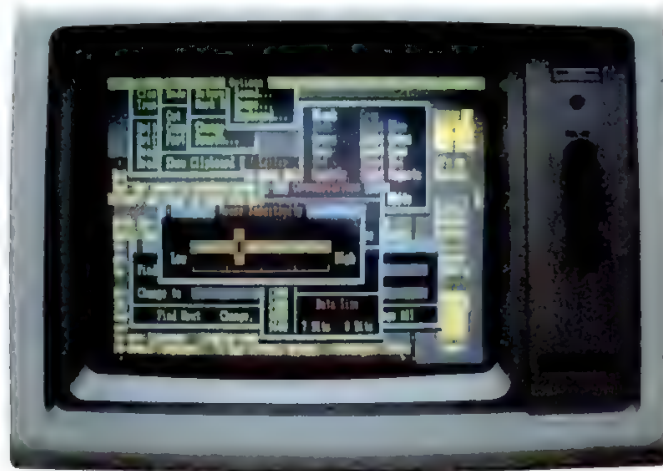
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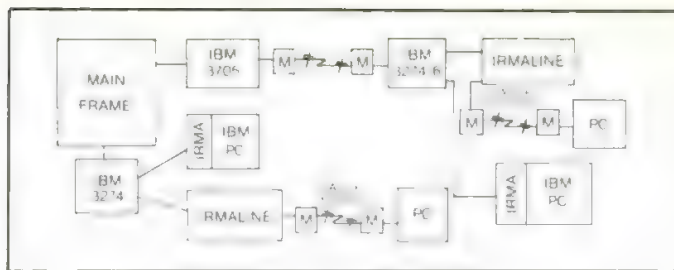
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CIRCLE 117 ON READER SERVICE CARD

WASH News

FROM THE EDITORS OF PC

AUGUST 21, 1984

AT&T to IBM: 'Watch Us'

With Olivetti-built PC 6300, AT&T technically bests IBM PC, announces \$100 UNIX switch program and twisted pair network for big organization users

BY BILL MACHRONE

NEW YORK—"Watson, watch us now."

That's AT&T's new slogan, reflecting its emergent market-conscious corporate profile. It was emblazoned in yard-high

Graham Bell's legendary assistant or to IBM's founding Watson family.

The AT&T PC 6300 is not just a me-too clone. It is a serious contender for the most-

is designed and built by Olivetti. AT&T owns 25 percent of Olivetti, a marriage that appears to be bearing fruit.

High Noon

The heart of the AT&T machine is an 8-MHz 8086, giving it performance that Charles Marshall, chairman of AT&T Information Systems, calls "50 to 80 percent faster than the IBM PC." Unlike IBM, which offers the PC and PC Portable without standard I/O facilities, the AT&T machine sports a serial port, a parallel port, a

clock/calendar, and hi-res monochrome graphics as part of its basic package. Marshall invited the audience to compare the machines side by side, an exercise he referred to as "electronic High Noon."

An AT&T machine with a hard disk, one floppy, 256K RAM, and the standard I/O described above, lists for \$4,985. A similarly equipped PC-XT costs \$4,845.

After the press briefing here recently, AT&T had a formal technical presentation of the

(continued)



letters over the heads of the AT&T Information Systems officials who introduced the company's long-awaited personal computer.

After looking at the machine, you have to wonder whether the phrase refers to Alexander

compatible title, and it bests the IBM PC in speed, graphics performance, and standard features. Further, it does so at a price that will make computing America sit up and take notice.

Tuned by AT&T for the American market, the machine

Are Good Looks Enough Today?

Enable is integrated package with that little extra something—for everyone

BY CONNIE WINKLER

BALLSTON LAKE, N.Y.—Can a nifty product from an unsung developer make it in today's high-stakes market for integrated software (the \$695 genre) packages?

With *Enable*, The Software Group, in this off-the-beaten-path community, is taking a shot at the market now seemingly

dominated by *Framework* and *Symphony*. *Enable*, which is expected in September, has it all: word processing, spreadsheet, graphics, database, communications, and up to eight windows.

What's neat is the touches: Files from *WordStar* (or 1-2-3 or (continued)

AT&T (continued)

machine's innards and architecture. For the tire kickers, they also had a roomful of PC 6300s running popular software.

A quick tour of the machine reveals a tilt-and-swivel 13-inch monitor sporting a unique and attractive character set. The low-persistence phosphor display shows none of the blur common to IBM's monochrome monitor, and it exhibits no discernible flicker.

There are seven expansion slots available inside, six for the hard disk machine. The keyboard, lamentably, has the same layout as the IBM PC. Like Compaq, AT&T was forced into this position by the preponderance of existing program documentation depicting the IBM layout. The keyboard has LED indicators on the Caps Lock, Num Lock, and Scroll

Lock keys. The keyboard's touch is lighter than IBM's, but not as light as a KeyTronic board's. There is an audible and tactile click on the downstroke, while IBM's upstroke "unclick" is mercifully absent.

A large, low-speed fan on the back of the case moves plenty of air while keeping the noise level acceptably low.

AT&T has clearly done its software homework, too. At the presentation, in addition to MS-DOS and Concurrent CP/M, its machines were running Ashton-Tate's *Framework*, Microsoft's *Flight Simulator*, and other popular programs. Further, the machines were attended by high-level individuals from the software companies, a significant show of support for the new PC. (The press kit contained a long list of programs that had already been tested on the

AT&T PC.) In keeping with Future Computing's "functionally compatible" rating of the PC 6300 (the highest), the list included bestsellers in virtually every category.

A UNIX Future?

One oft-asked (and determinedly unanswered) question was the possibility of a single-user UNIX 5.2 implementation for the new machine. AT&T officials maintained that MS-DOS was the right operating system for the machine, but did not disallow the possibility of UNIX in the future.

The other announcements that accompanied the unveiling of the PC made UNIX all the more likely. The offerings included a new network for high-end users, and UNIX application software for the 3B series of minicomputers, including *Mul-*

tipan, Microsoft's *Word*, and a variety of database managers. A \$100 context-switching program for the PC 6300 flips the machine from MS-DOS mode to UNIX remote terminal mode at a keypress.

AT&T has done its homework in the distribution area as well. The machine is available immediately through Computerland, Sears Business System Centers, the Genra Group, CompuShop, and AmeriSource, with others to follow. The AT&T national account sales force will, of course, handle the machine, but it is unlikely that the machine will appear in AT&T's own stores in the foreseeable future. AT&T officials are sensitive to IBM's apparent willingness to abandon retailers in favor of its own Product Centers. They are determined not to do the same. ■

Enable's Looks (continued)

Volkswriter or several other popular programs) can be dumped directly into *Enable* documents, with codes automatically removed. And *Enable* is as smooth (seamless, in today's jargon) as any integrated package *PC Magazine's* editors have seen: A chart can be integrated (truly) into a text file and print simultaneously.

The user can edit graphic images after they've been merged into text, and can manipulate the text as though it were a graphic image. Spreadsheets, likewise, can be combined with other types of data into a seamless whole.

Like *Framework*, *Enable* makes the IBM PC look good. It's packed into 192K—and it's fast. "Lightning fast" is how micro software maven Esther Dyson, who previewed the product, described it.

But, is fast enough? *Enable's* odds are "not all that great, simply because of marketing—that's what the market is all about these days," says Dyson, who publishes *RElease 1.0*, a newsletter, in New York.

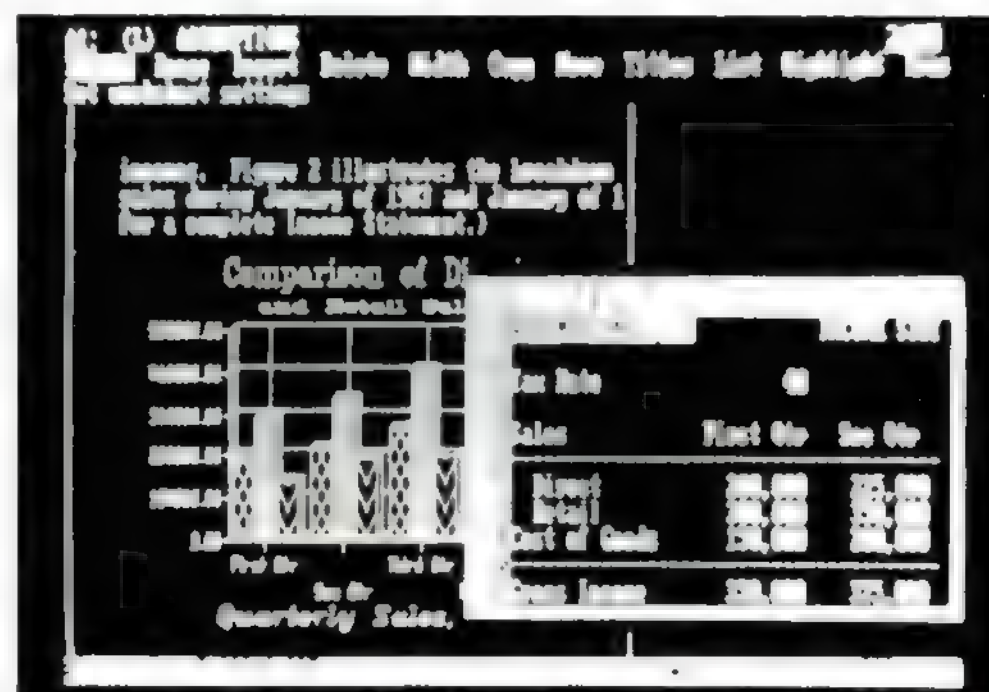
Television Battles

Major sophisticated integrated products, such as *Framework* from Ashton-Tate and *Symphony* from Lotus Develop-

ment, are being promoted with multimillion dollar (reportedly \$8 million for *Framework*) advertising budgets, including television time. These products are going into large corporations, Dyson noted, and it is precisely these buyers who are

sion advertising from the big guys will educate and butter up less-sophisticated users.

That's not to say that The Software Group won't advertise—they're readying a print campaign. And they have 10 sales people—out of 45 em-



most concerned with the issue of third-party support. They're more comfortable doing business with the name software vendors.

Of course, *Enable's* marketing team is undeterred. The big advertising budgets are "artificial barriers", counters Laura Hoffman, vice president of marketing for The Software Group. The Software Group rationalizes its competitors' big budgets to its own advantage: The televi-

ployees—visiting dealers.

Control Layer

The Software Group also rhapsodizes about *Enable's* structure and code, especially the Master Control Module (MCM), the layer on top of DOS, which supervises the applications. The MCM—not unlike IBM's mainframe CICS systems—takes over many functions of the operating system, Hoffman said.

"Applications don't care where the data is coming from or going to; the applications all interact directly with the MCM," she explained, adding that most of the programmers working on *Enable* have mainframe backgrounds. The tightly designed and dense code fits the package onto one disk. User documents are also stored in compressed format, so that users are limited only by disk space; a hard disk is not required.

To attract those users, the company is offering extraordinarily attractive deals—discounts of 66 percent—to dealers. And, the company is getting users involved in advisory boards.

The Software Group is headed by Ronald P. Quake, one of the entrepreneurs behind Bibliographic Retrieval Services (BRS), a highly successful international on-line information utility for bibliographic searches. Some of the proceeds of the sale of BRS to Thyssen-Bornemisza, Inc., an international conglomerate, were used to launch the Software Group.

Ironically, notes Hoffman, when BRS started in 1976, it jumped into a market dominated by heavily-funded, heavily-supported companies, notably Lockheed and Dialog. ■

IBM Brightens 3270 PC With Graphics Capabilities

"We expect significant growth in the use of color," IBM says as it goes after business graphics market

BY BILL MACHRONE

NEW YORK—Tantalizing. That's the word for IBM's latest 3270 PC announcements of color graphic workstations, accessories, and software.

As good as the 3270 PC's original color capabilities are, these new products, the 3270 PC/G and 3270 PC/GX, make them look amateurish. Product development manager John Baffa said, "We expect significant growth in the use of color." Although these products fall short of full-scale computer-aided design workstations, they fill a gap in IBM's lineup between high-end CAD (Computer-Aided-Design) terminals and PC color graphics. These products, with their 14- and 19-inch screens, are suitable for some CAD and high-end business graphics. "Our research shows that comprehension and retention are dramatically improved with color," asserted Baffa.

The 3270 PC/G is suitable for general-purpose engineering and business graphics. Its 14-inch screen can display up to eight colors in a 720-by-512 matrix, with as many as 3,920 characters on-screen.

The screen is managed not by the 3270 PC, but by a "display attachment unit" that provides local graphics processing, color fill, PC color-graphics emulation, and a variety of character sets. The pair adds \$4,660 to the price of a 3270 PC.

The 3270 PC/GX sports a 19-inch screen, addressable as 960-by-1000 graphics points, with up to 16 colors available. A 32-bit microprocessor manages graphic display chores. It is noticeably faster than the 14-inch model. The GX packs additional power to do a host of

graphics tricks, such as two- and three-dimensional transforms, translation, scaling, clipping, and rotation. It also emulates good old PC color

the host computer. They further ease its burden by locally managing cursor functions, area and pattern fill.

IBM hasn't ignored the range



graphics. This beauty will set you back a cool \$12,000, not to mention the price of a 3270 PC.

Mouse and Vectors

Both versions store their images as vectors, drastically reducing the storage overhead on

of graphics peripherals, either. There is a mouse (the familiar Mouse Systems optical mouse), a tablet, and a new color ink jet printer. The printer employs drop-on-demand technology, with easily replaceable ink cartridges. It prints in seven colors,

at 37 characters per second in character mode, or 3,100 dots per second in graphics mode. At this speed, a screen dump can take 4 to 6 minutes, but ink jet technology makes it happen in near-total silence.

The printer, dubbed the 3852, can print on roll-fed paper or transparencies. Transparencies are fed by hand. The paper is special, the short-fiber variety favored by other ink jet manufacturers to keep the image crisp. The printer will be available for \$900 in September.

These new products are significant in that they fill a gap between the 3270 PC's graphics and those of a high-end CAD workstation. They further legitimize the 3270 PC, and are careful to retain a PC-DOS environment, as well as the 3270 PC's windowing system.

The 3270 PC has been embraced by MIS departments, more so than by end users. These offerings will help to expand its sphere of influence beyond the DP department and out into the engineering department. The capabilities match or exceed those of many competitive workstations.

Mainframe Connection

On the debit side, there are some gaps in the product offering and a decided dependence on mainframe processing power. For instance, the GX version can display halftones, but they must be read into a mainframe running DISOSS with an IBM Scanmaster I document scanner. Similarly, almost any text editor that runs under PC-DOS can be used to get characters into the system, but there is no specific software that allows page composition. Nor does IBM have a reproduction-quality printing system (as yet) compatible with this product. The engineers appear to be stymied by the lack of standards for driving phototypesetting equipment.

While these new 3270 PC products are not exactly in the "affordable" category for many personal computer users, they will be welcomed by many businesses. Further, they clearly indicate where personal computer color graphics is going. ■

Speaking of Computers: Macs Are Selling Fast

"We reached our 50,000 unit sales goal in just 74 days. By comparison, it took 2½ years to sell 50,000 Apple IIs, and 7 months to sell the same number of IBM PCs. Consumer demand for Macintosh during the first 100 days was at least double the 70,000 units that we could produce."

Steven P. Jobs, chairman of the board of Apple Computer, Inc., referring to Macintosh Computer sales

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Inside



PC212A/1200 Includes: Modem Card, PC-TALK III software, card edge guide, modular phone cable, quick reference card, and instruction manual. **\$299**
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In The Beginning

In September of 1983 we introduced the first 212A

modem card for the IBM PC available for under \$300. The PC212A/1200 is a complete communications package including PC-TALK III software, modular phone cable, card edge guide, and instruction manual. The modem is an auto-dial, auto-answer type, which uses all the Hayes software commands so it can be used with any of the popular software packages including Crosstalk™ and Smartcom™.

We picked the best software package we could find based on it's ease of use and features, PC-TALK III. Our modem includes features the old industry standard missed out on. Like being able to fit in one slot in a Portable PC or PC/XT. Or an optional connector to use the modem's serial port when not using the modem. Of course the topper is the \$299 price, hundreds less than the competition.

Our standalone modem, the 212E/1200 can be used with any computer or terminal with a RS-232C serial port. You can use any Hayes compatible communications software on anything from an Apple to a Zenith. Many owners of IBM PC's are using it because they lack available expansion slots, or have more than one computer they want to use their modem with.

It's attractive gold anodized case houses seven status lights (who says low prices means a shortage of features). It fits comfortably under a standard telephone. It is also a 212A compatible auto-dial, auto-answer modem which supports all Hayes software commands. Even the switch settings are the same, so any software giving recommended switch settings for a Hayes modem can be used, without knowing

Outside

out the Qubie' 212A modems.

212E/1200 Includes: Standalone modem with cable (specify male or female), modular phone cable, and instruction manual. **\$329.**



what the switches do. There is a volume control knob for easy adjustment of the speaker's output. Included in the package is modular phone cable, a cable to hook it to your computer or terminal, and instruction manual. Choose the communications package right for your needs, and you're ready to go!

Four Hearts

The heart of the Qubie' modems are four digital signal microprocessors. Two handle sending, and two do the receiving. Rather than attempt to filter all but the relevant tones used for modem communications, the microprocessors measure the tones digitally. This allows them to overcome line noise and static better than analog filter based modems.

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Communications Is the Operative, Multi-layered Word at Regional PC Expo

'Coming soon to an exhibition hall near you'

BY MARTIN PORTER

NEW YORK—Communications was the name of the game at PC Expo here, another in the growing number of regional—and apparently successful—trade shows.

It was an opportunity for 250 vendors to flaunt new products—before the chaos of the big National Computer Conference (NCC) in Las Vegas—and to communicate with large purchasers, especially from the area's Fortune 1000 companies.

An emerging emphasis on micro-to-mainframe links was a common theme in the seminar presentations and three floors of displays. Cipherlink Corporation of Los Angeles, California, for instance, introduced what it called a "universal solution" to communication problems between incompatible computer systems and computer programs. The system acts like a software translator between two incompatible machines and eliminates rekeying to organize and use data from several incompatible sources. Cipherlink's "databridge" does not require the modification of either the source or the target computer.

Meanwhile, Information Builders took the opportunity to announce new OEM agreements with Texas Instruments and Wang for the use of its *PC/FOCUS LINK* software, which allows PC users to upload and download information to and from mainframes. The company had announced a similar product for the IBM PC last year. It also introduced *FOCTALK*, which allows an ordinary IBM PC, configured with only 256K and no hard disk, to make the mainframe connection.

Other micro-to-mainframe products on display included

Techland Systems' addition to its BlueLynx family of terminal emulators. The company announced an exclusive OEM agreement with IBM for a customized version of the 122 key, model 1A IBM keyboard subassembly. With the BlueLynx hardware/software combination, users can turn their PCs into mainframe terminals.

The demand for micro-to-mainframe capabilities may also affect the new generation of integrated software, it now appears. Cullinet made the New York announcement of its *Goldengate* integrated software package. Unlike Ashton-Tate's *Framework* or Lotus Development's *Symphony*, *Goldengate* is designed to work with a mainframe database product, Cullinet's own IDMS. In addition to mainframe communications, *Goldengate* includes a spreadsheet, document processor, local relational database, full-color business graphics, and a file manager.

Local Area Networks

The other hot topic in PC communications, local area networks (LANs), was well-represented by mainstay manufacturers like 3Com, Novell, Quadram, and Ungermann-Bass, though most product introductions had already occurred earlier at COMDEX in Atlanta. On the other hand, integrated software maintained a surprisingly low profile: Ashton-Tate exhibited *Framework* in a scaled-down booth and Lotus Development did not attend at all.

However, a start-up concern, ModTech International of Salt Lake City, was hoping to put a new wrinkle in the high-end software development with *LOIS*, software that can inte-

grate already-popular and competing software products such as Lotus' *1-2-3*, *WordStar*, and *dBASE II*. The program, which takes up only 4K of internal memory, automates file transfer between these programs and allows users to adapt their existing software library to the in-vogue "integrated" scheme.

In hardware, Quintar of Torrance, California, introduced a standalone graphics controller that can produce a 832-by-630 resolution picture with a PC. Upland Technologies displayed a compact 67-megabyte storage subsystem that makes a tape drive work like any other disk drive, using DOS version 2.0 commands.

More on Boards

And although its name may not be well known to consumers, Faraday Electronics of Sunnyvale, California, which earlier this month signed an OEM agreement with NCR Corporation for the use of its PC-DOS compatible products, made one of the more extensive

hardware announcements on the exhibition floor. Its PC Expo introductions included the FE 6420 series of IBM PC compatible single boards, the third in a series of standard format CPUs for the OEM market; a reduced-size floppy disk controller (Model 5141); and an integrated monochrome display adapter (FE 5200).

Why make product introductions at all at this relatively small regional trade show? Information Builders national sales manager (OEM) Peter Balestino voiced the consensus opinion: "The main reason is for Fortune 1000 exposure. You need a New York show to reach those buyers."

However, the show management thinks there is room for PC Expos outside the New York metropolitan area. In fact, show officials indicated that the formula will again be tested in Anaheim, California, September 24-26, as well as in Chicago, December 10-12. Coming soon this year to a exhibition hall near you... ■

Borland's Turbo Pascal 'Selling Like Hotcakes'

SCOTTS VALLEY, Calif.—Programming in Pascal has gotten a boost with the popularity of Borland International's \$49.95 Turbo Pascal compiler, according to the firm's marketing and sales vice president Alex Morton. In the product's first 5 months, 30,000 copies were sold.

"We believe software is overpriced. Pascal is a powerful language; we wanted to make it available to everyone," Morton said. IBM's Pascal is \$300; and Pascal MT+ from Digital Research in Pacific Grove, Calif., is \$600.

What attracts users to Turbo Pascal, aside from the low price, is the integrated editor that eliminates cumbersome separation of text editor and compiler, a problem in most other compilers, Morton says. The unification of editor and compiler is particularly impor-

tant in debugging when the user must swing back and forth between text editor and compiler. During debugging, Turbo Pascal displays the source code for the new program and automatically points to the error.

"We made Pascal accessible to programmers, university students, and beginners," Morton claims, adding that the menu-driven aspect makes Turbo Pascal even easier to use. And, touts Morton, his program is "up to 97 times faster" than other compilers, thus the "Turbo" designation.

Version 2.0, out since May, adds windows, color, sound, and graphics support to Version 1.0. Updates are \$29.95. A program supporting Intel's 8087 math microprocessor is \$89.95. Turbo Pascal requires only 33K and runs on the PCjr as well as on the IBM PC. ■

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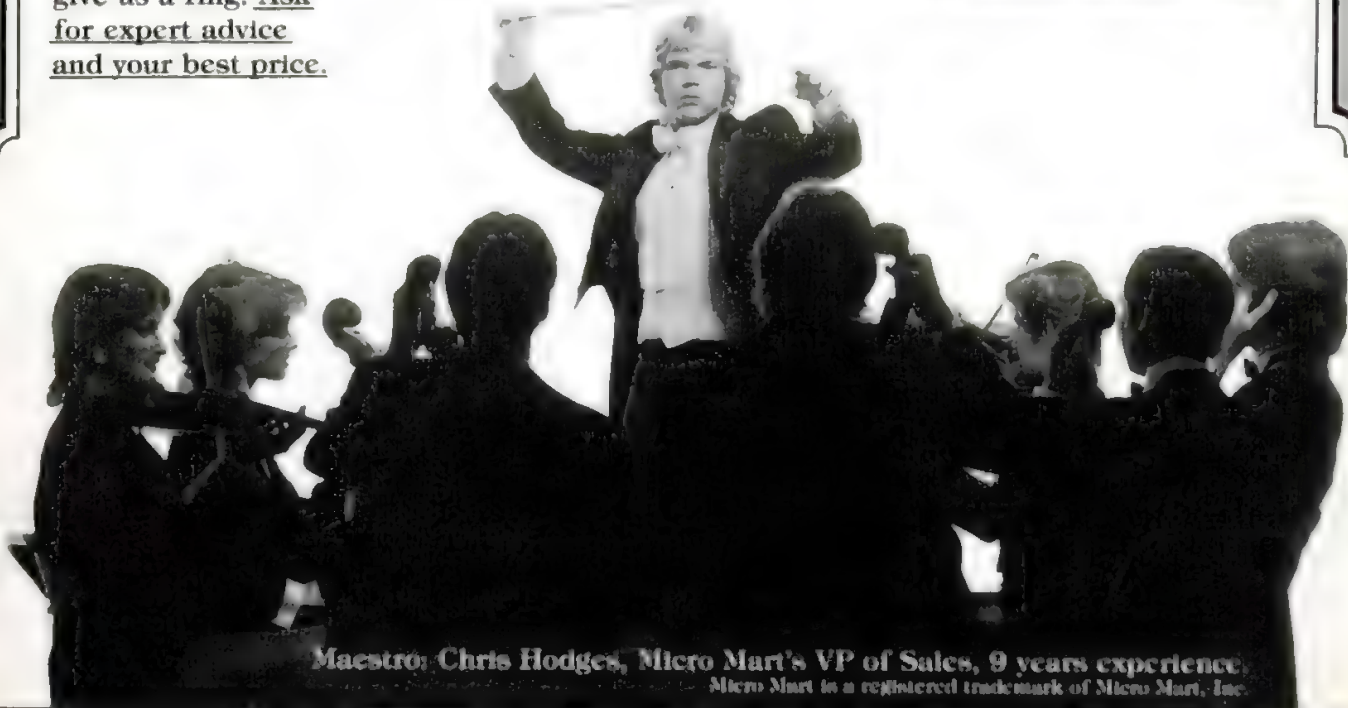
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IBM Clears the Air

Dear PC Magazine:

You recently reported on problems I was having with radio frequency interference causing spurious input from my keyboard (see "PCs Key In On Radio Signals" and "Running Interference," *PC*, Volume 3 Number 9, page 33). My father, with whom I live, is a ham radio operator, and his station, with all the legal and optional protection available, was still generating spurious characters on or outright crashing my IBM PC. I was finally driven to purchase a Keytronic 5150 keyboard, whereupon the problems abruptly stopped. I complained to IBM Customer Relations in Boca Raton, but the only response was: "Our product is FCC-approved."

Shortly after the *PC* coverage, I received a mysterious call from an IBM employee who would identify himself only as "Jack." He was a ham radio operator and PC owner who, like many I had talked with on CompuServe, had suffered the same problem.

He pointed out that the PC is susceptible not only to inputting but also to emitting RFI, especially in the 21 to 28 MHz band. He said this was inherent in the old 64K maximum motherboard and had been eliminated from the new 256K or XT motherboard, which began appearing around March 1983 when I bought my system. He also told me that the new keyboards introduced with the XT board have a "toroid," an RFI choking device, in the cable connector.

Jack advised: "IBM simply will not address the input situation. Go to them with the emission problem. Anxious to comply with FCC emissions standards, they'll give you a new motherboard and toroid-equipped keyboard, which will, coincidentally I'm sure, put an end to your input problem." Jack told me to write directly to Don Estridge (the man who led the PC development team). "He won't stomach any nonsense."

It was worth a try, so I did, and enclosed a copy of my letter to *PC*. Sure enough, a few weeks later I got a call from IBM Customer Relations: IBM will not accept responsibility for the susceptibility of the keyboard, but it is interested in happy customers and reduced RFI emissions. A service person will call.

On June 5, a service representative came out and systematically replaced the old motherboard with a new one of the same design, then replaced the power supply, and finally replaced the old-style motherboard with a 256K-capacity XT model. After the XT board went in, my ham operator, monitoring downstairs, noted a marked decrease in broadcast noise from "WIBM" (as my "station" is not-so-affectionately known). In the installation process, my A: drive somehow jammed and was forthwith replaced. The upshot was that I received one new XT motherboard with convenient new memory

capability, one new power supply and fan, one new disk drive—and no charge. I was impressed.

My old IBM keyboard was withdrawn from the closet and proved much less RF-susceptible working with the new motherboard. After some testing, though, it finally crashed *Volkswriter Deluxe*, generating a few spurious characters that looked like comic strip expletives as it went down. As promised earlier, my nearby ComputerLand, which had been a helpful intermediary all along, promptly provided a new, toroid-equipped keyboard.

Input susceptibility was even further reduced. But the new keyboard/motherboard combo is still susceptible to crashes when a nearby transmitter is run at 500 watts, on 40 and 75-80 meters; above this power, the computer goes absolutely bonkers. (For hams, the legal limit is 1,000 watts.) I have found that even the Keytronic, when assaulted by 500 watts at 40 meters, generates a few spurious characters, though it will not crash. Further, unlike the IBM, the Keytronic emits spurious RFI at only one place along the band: 3.555 MHz. The Keytronic is still less of an RFI producer than the toroid-equipped IBM keyboard, and a less-receptive antenna for external radio signals.

Even though my IBM keyboard is now back in the closet, I want to express my sincere appreciation for IBM's persistence in helping to alleviate, if not wholly solve, my problem.

Sincerely,

Travis Charbeneau
Williamsburg, Virginia

You Never Can Be Too Obvious

El CAMINO, Calif.—Cdex Corp., a publisher of disk-based PC tutorials, recently realized that the vast majority of PCs had double-sided disk drives, so it was safe for Cdex to switch its products from single- to double-sided disks. A small change indeed, but one that Cdex's promotion staff wasn't about to let pass unnoticed.

Emblazoned on every Cdex box and disk jacket are new stickers announcing: "Now on Double-Sided Diskettes."

Then, in a further fit of marketing inspiration, Cdex declares, "Also Runs On Popular Half-Heights."

Since a half-height disk drive is merely a drive with the same electronics in a smaller package, any 5¼-inch floppy can run in it—the slot's still the same size, after all. In any case, it never hurts an advertiser to point out the obvious with flair.

If this approach sells disks, however, we soon might see ads like, "Culture Club on C-90 cassettes—Also Runs on Popular Sony Walkmans."

—William K. Howard

My Word! A Four-star Performance

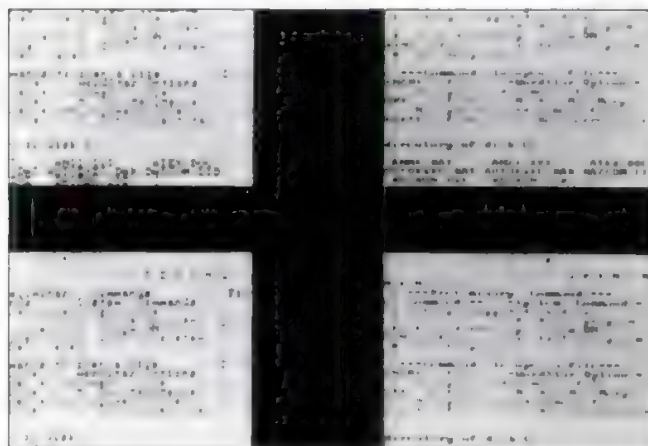
Old hands at *WordStar* are no longer shocked at finding new features in this program that aren't hinted at in its menus—or even in its documentation. But what would they make of this: an unretouched shot of *WordStar* split into four screen areas—all of them active! From this main menu you can start editing a document and have the cursor and your text appear in all four sections. Even though MicroPro has poooh-pooohed the usefulness of multiple screens, does the manufacturer have some

windows in its closet?

Well, no. The screen here, which appeared on an IBM color monitor, was produced by setting 40-column mode before loading *WordStar*. (From the DOS prompt, enter MODE CO40.)

We don't expect this kalidoscopic feature will make *WordStar* any more effective, but you might have fun slipping this effect into an AUTOEXEC.BAT file on a coworker's program disk.

—James Langdell



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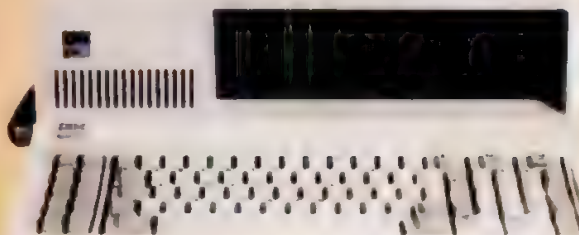
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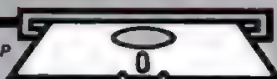
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Figuring It Out: IBM's Primer for PC Trainers

BY JAMES LANGDELL

IBM now offers an extensive (384 pages) and inexpensive (\$4.95) book to help instructors who train PC users. *Guide to Learning: Resources for Users of IBM Personal Computers* includes descriptions of about 350 instructional books, software, videotapes, and audio recordings. The guide also suggests how to use these resources in 15 courses involving the PC, and outlines a syllabus for each.

Guide to Learning was developed by IBM and the Human Resources Research Organization. Each listing describes the subject matter covered by the resource and suggests the type and education level of its target audience.



This information is certainly helpful, especially the syllabus section, but the book's organization leaves something to be desired. Information about each resource is split between three sections of the book. The main section lists each item by topic (such as word processing, hard-

ware, or programming languages) then within topics, alphabetically, mixing together books, tapes, training software, and actual applications packages.

These main listings don't include the address or phone numbers of publishers—for that you have to look at another section in the back of the book listing publishers (one list for periodicals, another for everything else). Price information isn't included anywhere.

A third listing section, the Selection Matrix, provides additional information about each item—if you can figure out how to get it from the tables. In 19 pages of charts, each resource is named only by a code, such as COM0060. You have to search back in the main listing section to find what the item actually is—COM0060 turns out to be Volume 1 Number 9 of *PC Magazine*, a theme issue about communications.

The book is designed with

generous amounts of white space in the main section—each page has at most two items. There's enough room that the information scattered in the Selection Matrix and publishers lists could have been consolidated in the main listings of the resources to make the book easier to use.

Little Icons that Can't

The most peculiar things in IBM's *Guide to Learning* are the 18 symbols that are used throughout the book to identify different topics. Unfortunately, the symbols don't have much intuitive connection with the subjects they represent. Several PC staffers tried to match up the symbols with their topics—our best score was only 40 percent. Try it yourself, then look for the inverted answers below.

The *Guide to Learning* can be ordered from IBM Direct, Dept. TT4, 1 Culver Road, Dayton, NJ 08810 for \$4.95 (add \$1 per book for handling). ■

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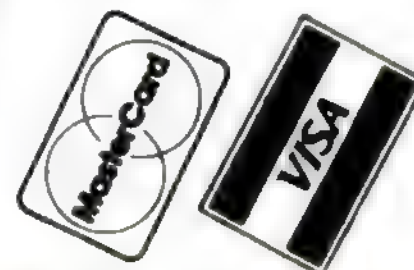
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PCs Get Asyst with Number Crunching

BY CRAIG STARK

NEW YORK—Most brainy PCs lead lives of quiet desperation, fettered to word processing and spreadsheet programs whose mathematical demands are hardly enough to keep an artificial intelligence alive. And while their PCs' 8087 arithmetic coprocessor sockets lie fallow, most scientists and engineers hold to the traditional belief that only minicomputers can meet their needs for serious mathematics and graphics.

Asyst, a new program from Macmillan Software Co., promises to change this limited way of thinking and to stimulate the silicon in the most underachiev-

ing PC or XT. With its three modules designed specifically to use the 8087 coprocessor and PC-DOS, *Asyst* represents a totally integrated approach to the problems of scientific and engineering data acquisition, analysis, and display.

Asyst provides user-selectable interfaces for widely used data acquisition boards (such as Data Translation, Keithley, and Teemar), and for standard output devices (HP plotters, dot matrix printers, and color graphics terminals). It also incorporates an easily learned programming language that allows a user to tailor the pro-

gram's very powerful built-in mathematical and display capabilities to his specific application, even to the point of assigning complete plotting and/or analyzing routines to a single function key.

Unlike many software programs, *Asyst* can utilize the full 640K memory potential of the PC. It permits up to 16 dimensions and up to 64K per array, and it includes a flexible array editor. The program provides all standard statistical and arithmetic operations and functions and, using the 80-bit precision of the 8087, can handle single- or double-precision real, integer, or complex numbers. (Most mainframe calculations are restricted to 64-bit precision.)

Fast Fourier transformations and inverses, differentiation and integration, and data smoothing and filtering are among the data-manipulation functions provided by *Asyst*. It

can also do matrix multiplication and evaluation, as well as root extraction of polynomials. Autoplotting with linear or polar coordinates and multiple user-defined windows are also provided.

Asyst is scheduled for release in September; its documentation will include extensive tutorial material. The aggregate cost of all three modules will be approximately \$1,700. PC requirements include the 8087 coprocessor, a minimum of 320K RAM, one disk drive, and a graphics board. Applications requiring an external data source will additionally require a suitable analog/digital board. The program may be put onto a hard disk, but one floppy disk is required during boot-up.

For more information on *Asyst*, contact Macmillan Software Co., 866 Third Ave., New York, NY 10022, (212) 702-3428. ■

Lights, Camera, Enter! Hollywood Goes PC

BY HARVEY BERGER

LOS ANGELES—The business of show business has finally come of age. For the first time, members of the Hollywood film and television community recently came together to scout many of the exciting new computer products available to help write and produce films and television programs. The American Film Institute held a small, 1-day seminar. Micros For Movies, and Live Time Productions put on the first 2-day Micro Show at the Los Angeles Convention Center.

The big attraction was show-business software, virtually all of it designed around the IBM PC and MS-DOS-compatible systems.

Welcome Developments

A welcome development is dedicated production management software. Budget preparation, script breakdown, scheduling and production logistics, and production accounting have advanced beyond the do-it-

yourself programming necessary with off-the-shelf spreadsheet and database programs. The vertical-market, dedicated packages come in all shapes and sizes, from \$500 for a simple budgeting program like *Associate Producer* (from Comprehensive Video Supply of Northvale, New Jersey), to \$27,000 for *FilmTrac* (from Constant-C Productions of Santa Monica, California).

The leading ones, however, seem to be those sporting the major industry clients. *data-Mogul*, from Quantum Films of Los Angeles, offers a combat-tested production budgeting and script breakdown program for a PC with 128K. Clients include MGM/UA and the Brillstein Company (producers of *Buffalo Bill* for NBC).

DotZero, also of Los Angeles, has budgeting and production scheduling software for the PC, but its other, related programs run only on the Apple II. Clients include Columbia Pictures and The Ladd Company.

FilmTrac is a budget and scheduling program complete

with a dedicated PC-XT. Just reaching the market now, the system has been used extensively by 20th Century Fox, first on a minicomputer, and for several months on the IBM XT as well.

Still in beta testing is *P.M.*, from Screenplay Systems in Burbank, a budgeting program designed by a working production manager and requiring only floppies. Others, like *FMS* from Heritage Systems of Cupertino, California, offer script breakdown, stripboard scheduling, budgeting, and accounting, but require hard disk systems.

Technical Carrots

Although the concentration at the shows was on applications, there were some technical carrots, as well. CompuPrompt, of Los Angeles, exhibited a color computerized system for on-camera electronic talent prompting.

But for *Star Wars* fans, nothing could hold a laser sword to Lucasfilm's Editdroid by Convergence of Irvine, California. This \$87,000 computer video-editing system uses videodiscs for maximum speed and a touch pad and trackball for fast, fingertip control. ■

New Newsletters

NEW YORK—There are two new newsletters of possible interest to PC users:

"VDT News: The VDT Health and Safety Report" will cover "all sides of the VDT debate," including the impacts of VDT use on operators, said editor Mark Pinsky.

The bimonthly is available for \$18 annually for individuals, \$35 for businesses from: P.O. Box 1799, Grand Central Station, New York, NY 10163.

For IBM and compatible users, there's a monthly report, "PC Accounting Trends," which covers audit, write-up and accounting practices. A subscription is \$59 per year from P.O. Box 435, 1850 Union St., No. 4, San Francisco, CA 94123. ■

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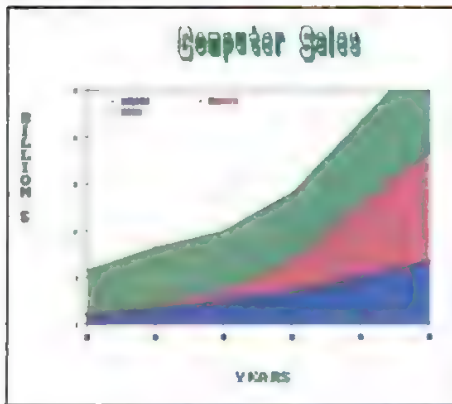
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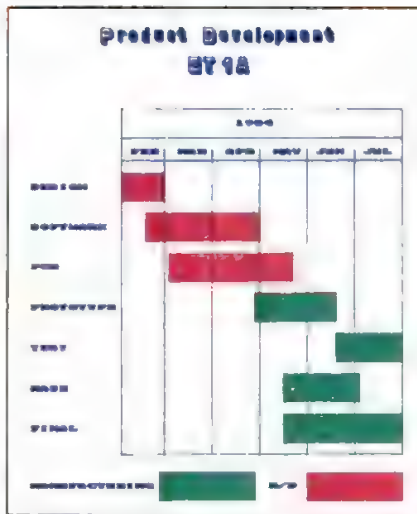
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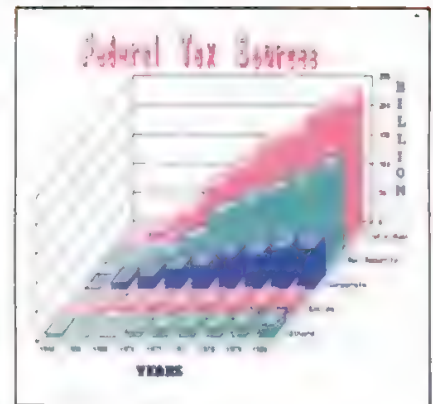
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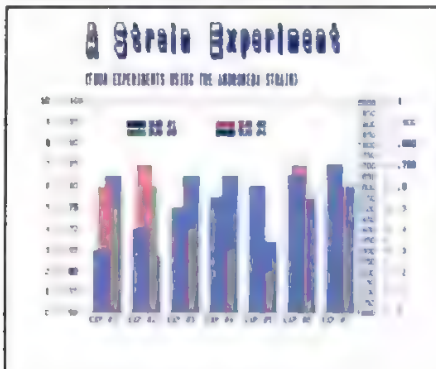
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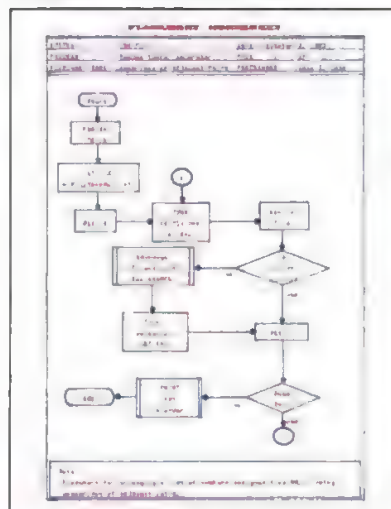
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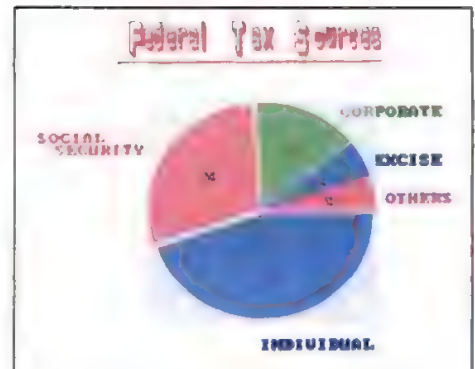
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BY TOM CHRISTOPHER

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List Price: \$3,295 (with one disk drive and 256K RAM)

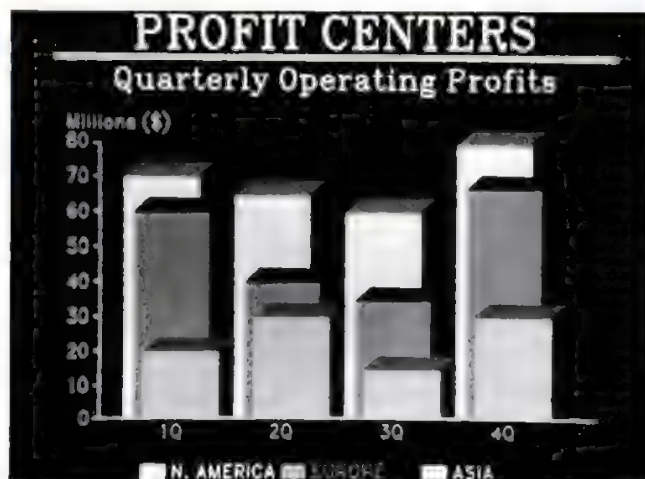
Business presentation graphics—or super graphics or whatever you want to call it—is becoming an important market, and General Parametrics, a new company in Berkeley, California, is tuning in.

The PC compatible VideoShow has a single disk drive, contains 256K RAM, and can be configured to any RGB monitor, TV set, or video projector and can even be videotaped with a voice-over. Its software is called *PictureIt*, which also runs on MS-DOS systems with 128K RAM. A phenomenal range of 1,000 colors allows very subtle effects in blending and combining tones.

The resolution is turbocharged with a technique called MacroVision that replaces pixels and pixel triads with variable groups of dots. This process involves hardware and software that can individually address each dot to turn it on and off at

be chosen by the user from a range of fonts stored in removable cartridges.

This laser printer can be used with a variety of office equipment. To create links between PCs and its LP4120, Ricoh collaborated with Computer Visions, a consulting firm in Oakland, New Jersey. James Hare of Computer Visions says that the software makes the laser printer work fairly well with



ten different levels of intensity. Until now pixel intensity level has always been your choice—as long as you chose on or off.

General Parametrics has redefined the number of dots in a pixel and packs in as many as ten RGB elements, depending upon the color and the screen area to be covered. This is the first time this has been accomplished on a micro. The results are crisp and colorful.

Remote Control

The unit weighs 16 pounds and comes with a nifty handheld remote control device so, the-

oretically, you can glide back in your Barcalounger, sip iced tea, and create instant business presentation graphics. Not a bad idea. There's a large market for a system like this for both in-house presentations to employees, board meetings, and sales conferences, as well as outside presentations to clients.

The benefits of a self-contained system such as this include the price (under \$4,000), quality control and security. Specialty houses can charge up to \$100 a slide and add extra variables to material that is often sensitive or timely. VideoShow lets you create your presentation in your own "bug"-free, lead-coated room, handcuff the system to your wrist, and take the back alleys to your meeting.

The only serious drawback to the concept of VideoShow is that it doesn't allow for much input creativity. You can't draw or create anything new.

Limited Formats

Here is where VideoShow lets down. There are only 25 different slide formats. The typography and color choices are nice and they can be overlaid and mixed to some extent. But unless there are a lot of optional software packages with many more designs and layouts updated on a frequent basis, this format will quickly become stagnant.

VideoShow, for all of its baby pixels and 1,000 colors and remote control, is too rigid in its design options. The company has promised additional presentation options, but for now there is not enough creative input. ■

Laser Printer Puts PCs on Its Beam

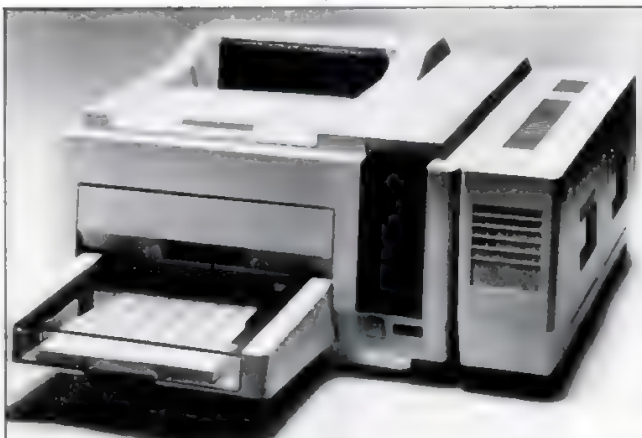
WEST CALDWELL, N.J.—A new 112-pound, tabletop laser printer, the Ricoh LP4120, can print the text output of a PC at a rate of 12 pages per minute. The laser printer generates four different 128-character fonts; two fonts are built into the printer's controller, but the other two can

most programs, but the company has developed drivers fine-tuned for specific programs such as 1-2-3, dBASE II, and WordStar.

With the current Ricoh LP Controller 120, the laser printer can only produce character output. Ricoh plans to offer another controller that can handle bit-mapped graphics.

For PC users, the company also makes a line of three daisy wheel printers, each with both serial and parallel interfaces. They are the 20 character-per-second (cps) Model RP2200Q (\$800), the 40 cps model RP1500Q (\$1,500), and the 50 cps RP1600Q (\$1,900). These letter quality printers are designed for relatively quiet (50 decibel) operation.

The price of the Ricoh LP4120 laser printer is approximately \$14,000. For more information, contact Ricoh Corporation, 5 Dedrick Place, West Caldwell, NJ 07006, (201) 882-2000. ■



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2350	350 cps	2000
2410		2380

Star Micronics

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Delta 10	160 cps	448
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NEC

3550	40 cps	1690
7710	55 cps	1899

Brother

HR1	16 cps	569
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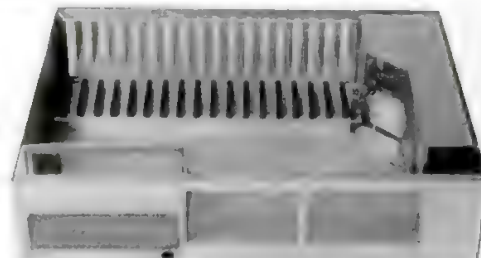
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PRODUCT REVIEW

Microsoft's Word 1.1 Cuts the Perspiration

BY ALAN HOENIG

Word, Version 1.1

Microsoft Corporation
Box 97200
Bellevue, WA 98009
(800) 426-9400
(206) 828-8088

List Price: \$375

Requires: IBM PC, XT, or PCjr, one double-sided disk drive, 128K RAM. (Note: To see character attributes such as italic, superscript, etc., displayed on screen, a graphics card is required. In addition, not all printers support all the attributes and different printers support different type fonts.)

Writing, to paraphrase Thomas Edison, is one percent inspiration and 99 percent perspiration. The first version of Microsoft's Word word processing program was a notable effort to improve that equation especially in rewriting and re-rewriting. Word was at once extraordinary and idiosyncratic; extraordinary in the efficiency with which you could use it to pound a document into submission, but idiosyncratic in that many mundane but vital chores were far more difficult to perform than necessary ("The Unfinished Word," PC, Volume 3 Number 3). Now, Microsoft's release of Version 1.1 of Word removes most of these problems while retaining the strengths of the original.

The original's strengths include super formatting, instant on-screen reformatting, on-screen display of print characteristics (double underlining, small caps, and italic, for example), an undo command, graceful and easy footnoting, and its special rubbery cursor. But those features are just the tip of the iceberg.

One of the original Word's best features is its pioneering use of windows. Word uses a nonoverlapping window tiling

system. Up to eight files each have a separate window, or several windows can be applied to different parts of a single file.

Comfortable Mouse

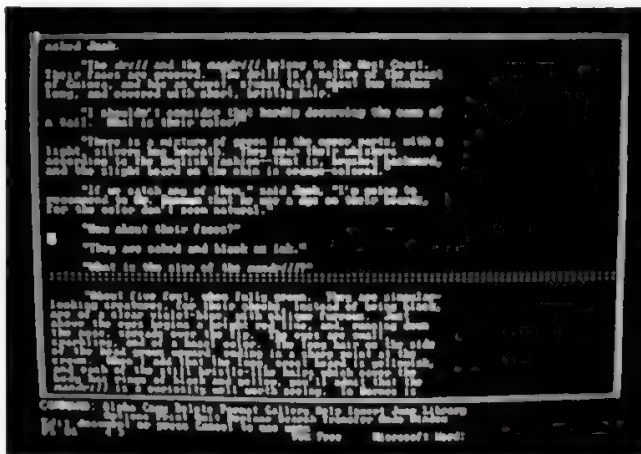
The original Word also has extensive mouse support, and I have found the system's mouse so natural to use that it has become indispensable to me.

Unusual power also resides in

Not Perfect

But the original Word wasn't perfect. Some tasks gave it fits. File save operations were incredibly lengthy. Saving a 3,000-word file required about 40 seconds. There was no on-screen indication of where in your document file you were. Some critics felt that the monitor area allocated to text was too small, severely limiting the amount of text visible at any one time.

The program came on two copy-protected disks, so startup involved a clumsy disk-swapping process. There was no print merge or spelling check facility. (Word's document files are created differently than those of any other word pro-



Microsoft Word 1.1 displays condensed monochrome text with a Hercules board.

Word's cursor. Normally a highlighted rectangle the size of a single character, it can be stretched and pulled like a piece of Silly Putty to cover any portion of your text. Word commands apply to the entire region thus selected. Block moves, in particular, are quick and easy.

The original Word also supports an on-line, context-sensitive help feature, glossary buffers so you can add boilerplate paragraphs instantly, and style sheets—collections of special format descriptions. Such style sheets, which seem to be an emerging trend among 16-bit word processors, allow you to apply complex and personalized formats to your documents with a few quick keystrokes. They are handy for consistently achieving the same look among different chapters of a book, among other uses.

cessor and are unreadable to standard spelling checkers.) Finally, the original version of Word supported only a few printers.

The new enhancements contained in Version 1.1 address these criticisms and acceptably speed up file save. The same 3,000-word file can now be saved in 20 seconds. Word now tells you what page in your document you are on, provided you have invoked the PRINT REPAGINATE command (which has also been substantially speeded up) or printed the document. On the fly, Word still can't give any information on line number or character position, but probably no program complex enough to accommodate documents with running heads, different size type fonts, and multicolumn printing could do any better.

The screen display area also hasn't changed, but if your system contains the Hercules Graphics monochrome adapter card, you can select a compact-display mode that replaces the standard 80 columns by 20 rows of normal characters with 93 columns by 40 rows of compressed characters. Descenders are lost but character quality and size is similar to that of the Osborne computer's display.

Hard Disks

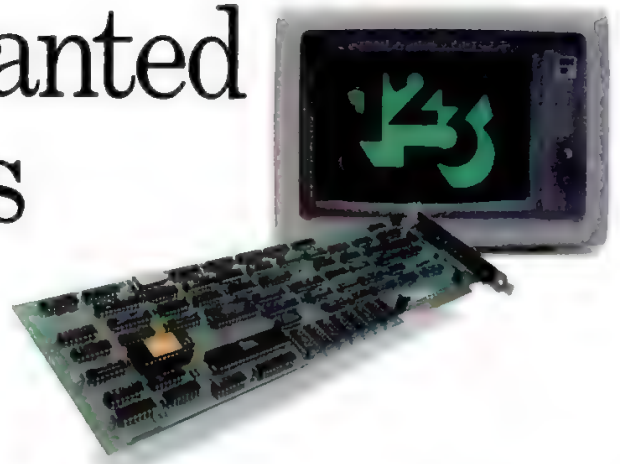
The Word program disk is still copy protected, but it's now a single disk, making program startup much smoother. Microsoft distributes a second disk for backup and stands ready to replace defective disks for any registered user—a relatively reasonable way to handle the copy protection dilemma. Version 1.1 also has a batch file that lets Word be copied to a hard disk, thereby eliminating the need to boot from a floppy. Using DOS commands, Word 1.1 can also be copied into a RAMdisk.

A merge facility is standard in Version 1.1, and the program now works directly with the output of dBASE II and other programs. Several spelling checkers from independent vendors, including my favorite, The Word Plus by Oasis Systems, have been specifically tailored to work with Word.

Finally, Word now supports over 20 different printers, including three generic teletype-like printers, and Microsoft includes (cryptic) instructions for printing on just about any printer. As soon as the hardware becomes available, Word Version 1.1 will be able to drive laser printers, automatic typesetting machines, and just about anything else. At that time, Word should be able to deliver camera-ready, professional copy.

I have extensive experience working with both Microsoft Word and Wordstar. Ease of text entry is about the same for both processors, but Word pulls far ahead in editing. When it's time to rewrite and re-rewrite, Word is about twice as productive. With the update to Version 1.1, Microsoft Word has become my word processor of choice. ■

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No PC Shopping Sprees for Fortune 500

NEW YORK—Most U.S. corporations don't like to go shopping, especially for personal computers. This was only one of the facts uncovered by The Omni Group, Ltd., in its recent survey: "The Office Automation Challenge: American Business Responds." The Omni Group,

an office systems consulting and research firm, interviewed over 800 executives from companies of varying sizes to determine office automation purchasing strategies and objectives. The survey was underwritten by 12 information technology and service companies, including AT&T Information Systems and Hewlett-Packard Co.

U.S. corporations dislike going to retail stores for their personal computers and word processing equipment; they

would rather deal directly with the manufacturer. Incidentally, purchasing office equipment from an IBM Product Center is considered the same as purchasing straight from the manufacturer. Warren Walbrand, director of research at The Omni Group, found that companies want to purchase equipment from manufacturers that seem stable and economically viable.

Another finding, which will surely disappoint personal computer manufacturers, is that sec-

retaries in most Fortune 500 companies will continue to use dedicated word processors as opposed to personal computers for at least the next 2 years. The margin will be a little narrower for small and medium-sized companies.

The office automation survey also revealed that the use of local area networks to connect word processors, personal computers, printers, and even mainframes, will proliferate over the next 2 years. —Jane Mintzer

Calendar of Events

DATE	EVENT	COMMENT	LOCATION	CONTACT
August 2-4	Great Southern Computer Show	Hardware, software, accessories targeted towards business end-users.	Civic Center Charlotte, NC	Great Southern Computer Shows P.O. Box 655 Jacksonville, FL 32201 (904) 356-1044
August 12-15	1984 ASME International Computers in Engineering Conference and Exhibit	Panel discussions, paper presentations, product exhibits.	Hilton Hotel Las Vegas, NV	American Society of Mechanical Engineers 345 E. 47 St. New York, NY 10017 (212) 705-7795
August 12-17	The Radcliffe Computer Publishing Course	Course on how computers are changing publishing industry.	Radcliffe College Cambridge, MA	Radcliffe Publishing Procedures Course 6 Ash St. Cambridge, MA 02138 (617) 495-8678
August 16-17	Local Area Networks	In-depth look at local area networks.	Ramada Inn-Old Town Washington, DC	Institute for Advanced Technology Control Data Corp. 6003 Executive Blvd. Rockville, MD 20852 (800) 638-6590 (301) 468-8576
September 5-7	National Software Show	Microsoftware specific trade show.	Anaheim Convention Center Anaheim, CA	Raging Bear Productions 21 Tamal Vista, #175 Corte Madera, CA 94925 (800) 732-2300 (415) 924-1194
September 11-14	UNIX Systems Expo/84	Conference and exhibition for users and resellers.	Los Angeles Convention Center Los Angeles, CA	Computer Faire, Inc. 181 Wells Ave. Newton, MA 02159 (617) 965-8350
September 20-23	Userfest/New York	Hardware, software, accessories.	Madison Square Garden New York, NY	Northeast Expositions 822 Boylston St. Chestnut Hill, MA 02167 (617) 739-2000
September 27-30	Mid-Atlantic Computer Show & Software Exposition	Hardware, software, accessories.	Convention Center Washington, DC	CompuShows P.O. Box 3315 Annapolis, MD 21403 (800) 368-2066 (301) 263-8044

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Does the company offer a variety of products?

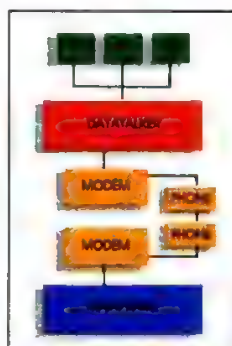
You should have your choice of stand-alone front-end processors, IBM PC or XT boards, or an OEM board. All ready to run on the most popular operating systems.

Can I get fast answers to my questions?

Insist on toll-free access to qualified service personnel before and after the sale.

What if I need a quick analysis of a problem?

Ask if the manufacturer has a Communications Test Center for product testing over public phone lines. And find out if the system has internal diagnostics.



Suppose something goes wrong with the unit?

The company should offer a 30 day money-back guarantee and a 12 month warranty that includes a free replacement unit.

What about future product development?

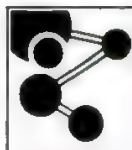
Make sure the products you're going to need soon will be available soon.

Who am I dealing with anyway?

How long have they been in business? The longer, the better.

How much is all this going to cost?

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for the
IBM PCjr.

PRODUCT REVIEW

SELECT Bilingual: ¿Usted Habla Español?

BY DAVID OBREGÓN

SELECT Bilingual Word Processor

Select Information Systems
919 Sir Francis Drake Blvd.
Kentfield, CA 94904
(415) 459-4003

List Price: \$395

Requires: 128K RAM, two
360K drives, PC-DOS 2.0.

"¿Como esta usted?"

"Muy bien, gracias!"

If the above is about all the Spanish you've used in the last few years, then *SELECT Bilingual* is more word processor than you'll need. Though it is a full-featured word processor in its own right, its primary benefits most probably will be felt by the growing number of companies with employees more fluent in Spanish than in English.

"*SELECT Bilingual* is intended for businesses with Spanish-speaking employees, or those doing business with Spanish-speaking firms," says a spokes-

person for Select Information Systems, the software's producers. "Users can interact with the program in either English or Spanish, and create new documents, or edit existing ones, in either language from either language, regardless of their previous computer experience."

SELECT Bilingual allows a document to be created by someone using the menu-driven commands in one—human—language, then later edited by someone else who prefers the commands and help screens offered by the program in its other language. The language of the document does not matter as its full range of editing, formatting, and printing functions can be accessed from English or Spanish for any text file.

The software uses single key-stroke commands to perform the various functions expected of a word processor, separating functions such as ERASE and SAVE with the Esc key. Commands are listed at the top of the screen during the creation or editing of a document, and each function is called forth by its

initial—E for ERASE, C for COPY, and so forth. (In keeping with the program's penchant for mnemonic commands, in Spanish the same commands are B, for BORRAR, and D, for DUPLICAR.)

All this may sound clumsy, and indeed it takes up a lot of memory, but it works. The program's use of the conveniently located Esc key to switch modes quickly becomes second nature, even to this *WordStar* user.

The included "Teach/Tutor" can have a user working smoothly with the program within 90 minutes, in either language. Help screens, which summarize each listed function, are available with a single press of the H (for HELP in English mode) or G (for GUIA in Spanish mode), plus the first letter of the command in question. The total effect is to make the program remarkably easy to use, regardless of the primary language of the user.

SELECT Bilingual's two manuals, one each in English and Spanish, offer clear and concise instruction in the program's varied functions and complement the Teach/Tutor facility so that the user is working with the system quickly.

To print the range of special punctuation characters used in Spanish, the software makes use of the IBM PC keyboard's plus

sign (+) (to the right of the numeric keypad) as a Compose key. To create the upside down question mark (¿) used at the start of this review, for example, the user would hit the Compose key, then the Question Mark key. The new punctuation mark appears on-screen exactly as it would in print.

Among other features are the ability to print one document as a background operation while the user is editing a second, and the ability to display boldface or underlined words on-screen as either highlighted or underlined words (monochrome display) or in different colors (color display).

All these capabilities take up space in a system's memory—the program is on four double-sided diskettes, each filled almost to capacity, and the installation procedure actually recommends erasing some of the files on the working master disk to make room for the newly installed program. Two double-sided disk drives is a definite must, though for more effective use of the software's *Spell/Ortografia* spelling checker and Mail Merge utilities, a hard disk drive is strongly advised.

Still, for businesses where "¡Buenos dias!" is as common as "Good morning!" *SELECT Bilingual* can serve well as the word processor of choice. ■

How Sweet It Is

The newest computer chip on the market isn't made of silicon, doesn't contain any memory, and will mess up your PC chassis. But it does fit in your mouth and you'll probably remember it because this chip is made of chocolate.

The Chocolate Chip, from Chocolatek of San Diego, contains a double-dip (54 grams) of imported dark Belgian chocolate formed with great detail into a VLSI (Very Large Scale Interpretation) of the ubiquitous integrated circuit computer chip.

The form is modern but the chocolate itself is old-fashioned. The editors at *PC* thought it was good enough to raise the possibility that Very

Large Scale could also apply to users who attempted to add too many of these expansion devices to their systems. While the

chip may not hold 256K, it's certainly well over 256C (Calories, that is). When asked to reveal precisely how many, Bob Ker-

stetter, one of the chip's two creators, would only say, "too many."

Looking to the future, A. Wasil, the chip's other block, says the company's marketing plan includes a European version, identical to the American one. Since taste in chocolate is incompatible across the Pacific, the Japanese version will require a more bitter blend. Chocolatek also has other computer related products in the works. "The transition to the 21st century will be much easier with a little chocolate on your face," the company suggests.

The Chocolate Chip will be available for \$6 to \$8 at department stores. Chocolatek is at 4475 Mission Blvd., Sweet 211, San Diego, CA 92109, (619) 272-7720. ■



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People in the News: "Jim Button"

PC-File designer disguises his identity, but now flaunts his special product

BY MARTIN PORTER

SEATTLE—Is Jim Button going legit?

The elusive denizen of "free" software—noted for his *PC-File* database program—has reevaluated his distribution methods, published "official" documentation, and is about to launch a series of new PC software titles, all of them available through mail order and for under \$50 each.

Advertisements for the products may even hit the trade magazines, and don't be surprised if you soon find the "people's software" as the latest entry on your dealer's shelf.

None of this is surprising by traditional software publishing terms. But there has been nothing traditional about the way Jim Button (an alias) has worked so far. *PC-File* (a *PC Magazine* reviewer recently called it "a meat and potatoes database...maybe the best money you'll ever spend") has been legitimately sold to over 6,000 clients. Button's yearly income from software alone is in "the 6-figure range." One of his biggest clients is the IBM Corp., which uses the program in several of its branch offices and research labs (the company paid Button a one-time fee to duplicate the program with impunity).

Button has a surprisingly good sales record for someone who has never advertised his product and still supplies documentation on the un-copy-protected floppy disk. He even offers free usage to PC users' clubs and authorizes *anyone* to copy it for "evaluation purposes."

Copy, Copy, Copy

However, Button isn't naïve about controlling the "unauthorized distribution" of the popular database. He estimates that there are over 50,000 copies of *PC-File* spinning in disk drives

throughout the world.

"It was never my intention to make money on it. I wasn't in the software business," he explained recently. However, the first edition of *PC-File*, released in July 1982, circulated throughout the Seattle, Washington area where Button lives and works. He saw that people were using the program but, more importantly, were calling



him up with improvements. That was when he decided to assume a pen name as well as take control of what was happening to his product.

"It was starting to snowball, starting to get away from me. I didn't want to lose my rights to the program and felt it was time to exert my copyright," he recalls.

He didn't anticipate what would happen next. In fact, he simply saw his "business" as a glorified hobby to pay for his "computer habit." He put a \$45 price tag on the product, and even included an invoice with the on-disk documentation along with an open appeal for software consumer decency.

Some Warning

"Please join the experiment," it reads. "If you believe in these ideals, your contribution is solicited to help make them work."

It worked. Even though he had been skeptical, and his wife "didn't think anybody would pay a penny for it," the orders began coming in.

It's a combination of the low price and the quality of the product, Button explains. "People want to encourage that. They figure they can remain honest for almost nothing."

Button receives more than checks in the mail. He received additional design advice from his enthusiastic customers, as if they had a share in the success of the product. Today the suggestions come in so frequently that Button has to revamp the product three times a year.

The next *PC-File* update (*PC-File III.3*) is due in October. The newest version contains improvements including a full-screen editor, a browse mode to view 20 records at a time, and global update and delete. The new "published documentation," which Button is offering separately for \$4, comes in a package of ring-bindable pages that fit neatly into the IBM documentation binders. The printed documentation will now accompany an abbreviated on-disk tutorial.

Loving Users

"The documentation was originally just thrown together. But I got a lot of suggestions on it. I tuned the documentation like I tune the program," he admits.

"I have strong feelings about this aspect of the *PC-File* phenomenon. I realize that if I went into a locked room for 5 years, I couldn't have come up with a program as nice as this. A program needs the feedback. I give the users credit. Every change in the last few versions came from the user input."

Interestingly, the suggestions come in waves, as if the users have an emerging common

need. "With every new release I put to bed, I think I've done every neat thing anybody can think up. And then things like global update and delete come up. Two releases ago, nobody suggested it. Then, within a week, I had five suggestions. Go figure it out."

Follow Products

Button has stopped trying to figure it out. He has hired an employee to handle telephone calls and orders. He is especially grateful now for his anonymity, though he was willing to have his photo published in *PC Magazine* for the first time. And he is gearing up for his new software releases: *PC-Graph*, which will allow users to create a variety of graph forms from *PC-File*; *PC-Dial*, a communications package; *PC-Calc*; and *PC-Type*, a word processor.

With his mailing list of customers he expects the new products to take off faster than *PC-File* did. Still, he hasn't quit his job in the Seattle area. His company won't let him tell who he works for either, though he explains it isn't Microsoft nor any other local software firm. *PC-File* was written in Microsoft BASIC, though originally for the Apple II.

Button does see impending competition from a new generation of "legitimately" distributed low-cost databases, but that should "make the high cost guys drop prices, as well."

Nor is he married to the idea of alternative distribution. If—or when—he sees the future closing in on his mail-order scheme, he would consider selling the product outright to a software publisher.

"I'm not a philanthropist. As long as I'm having fun doing what I'm doing it's all right. But I'm open to suggestions. I'm so open to suggestions that my brains are falling out." ■



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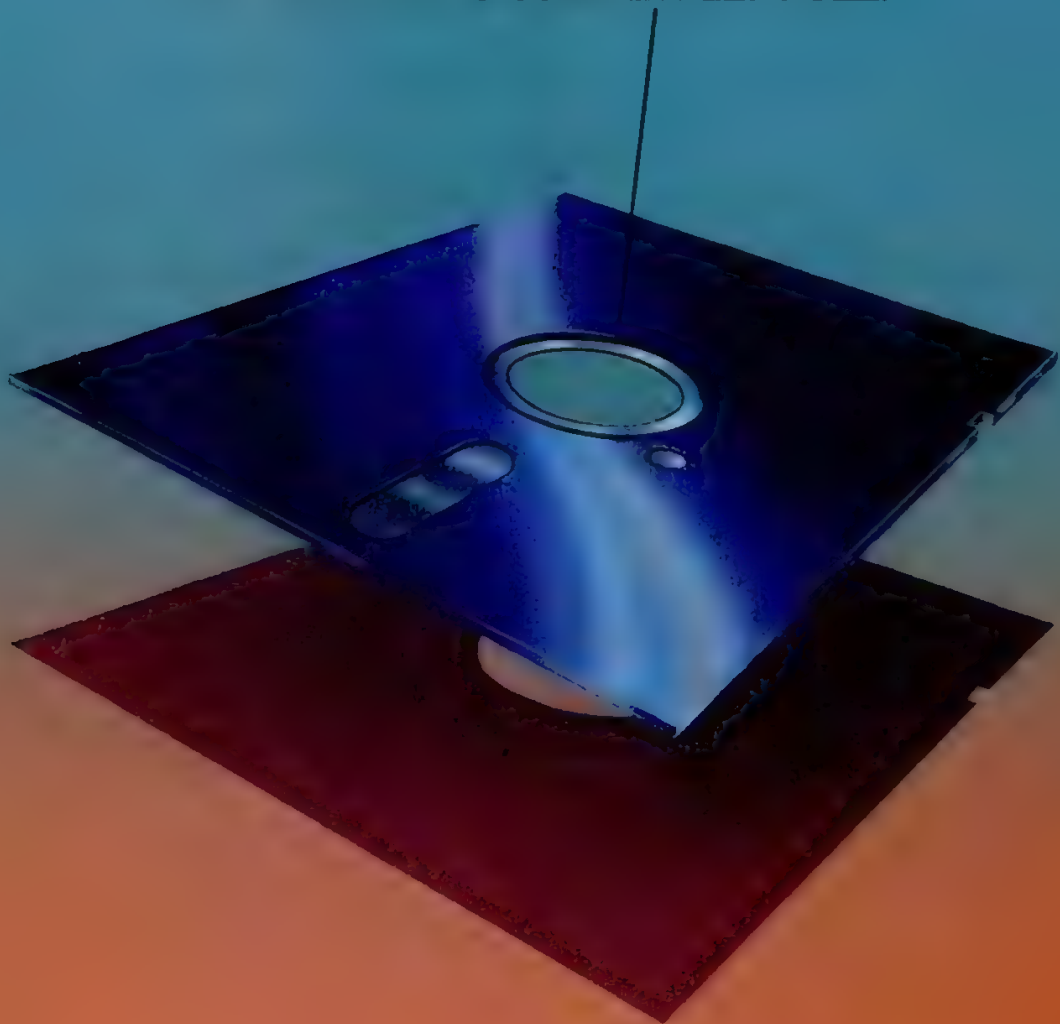
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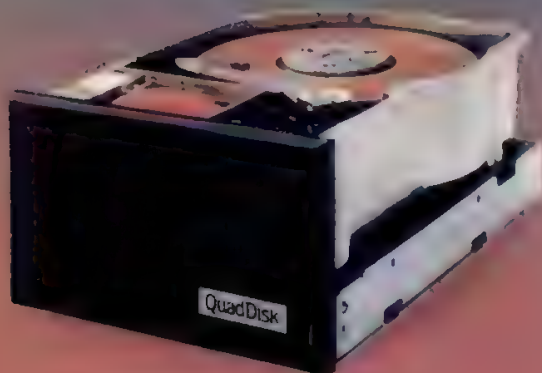
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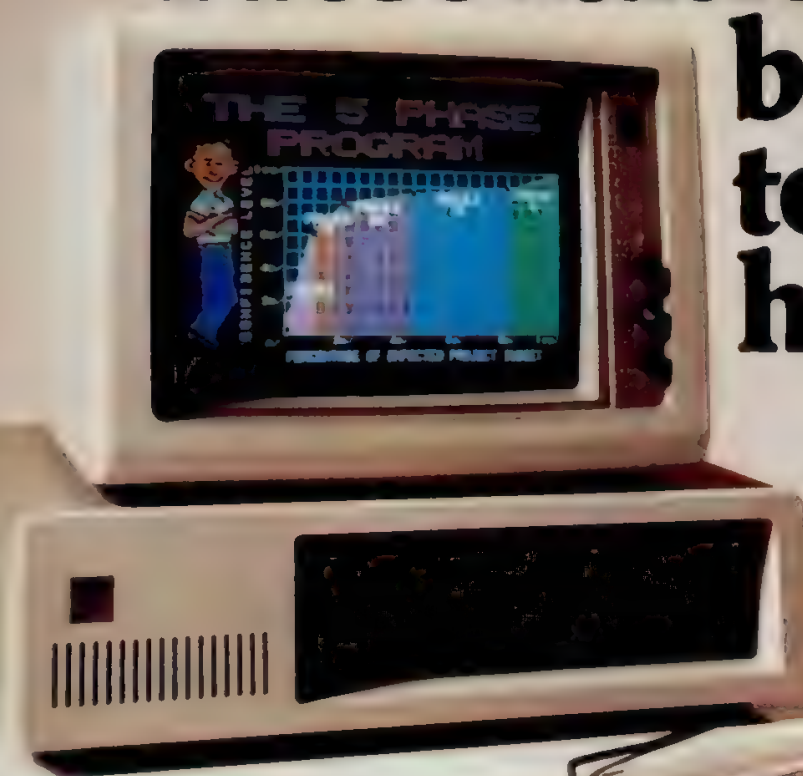


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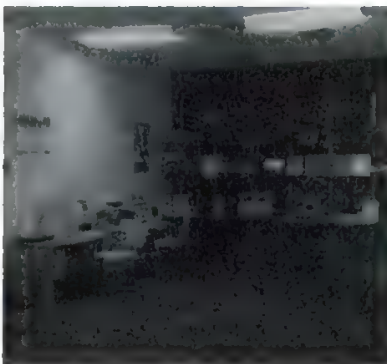
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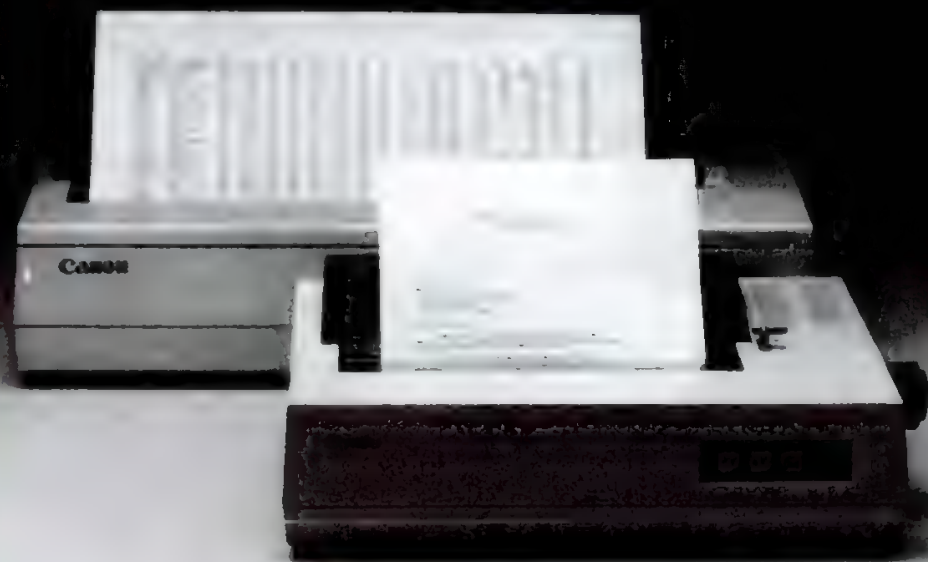


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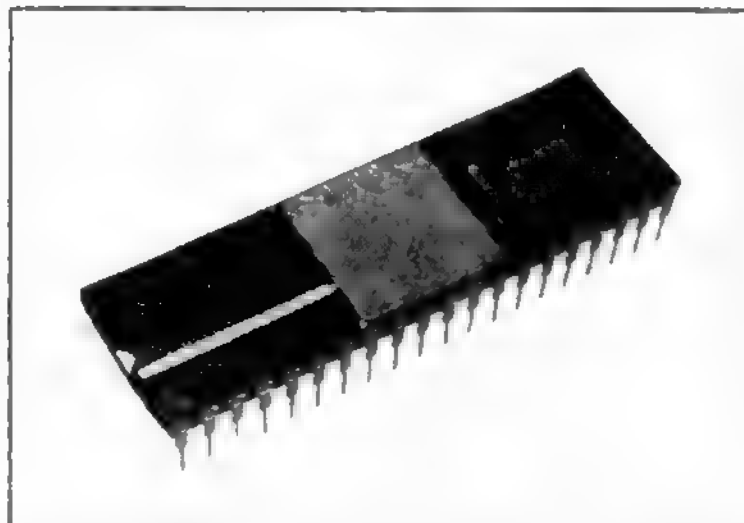
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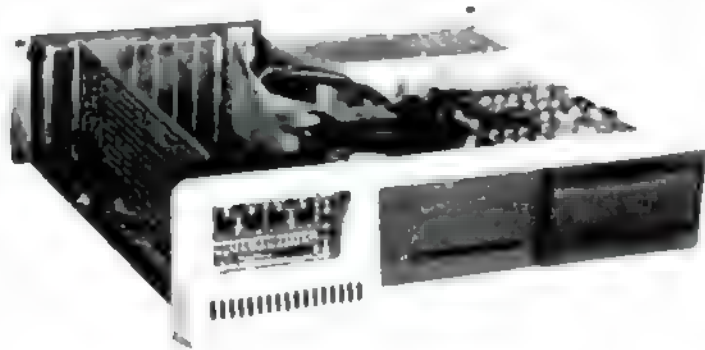
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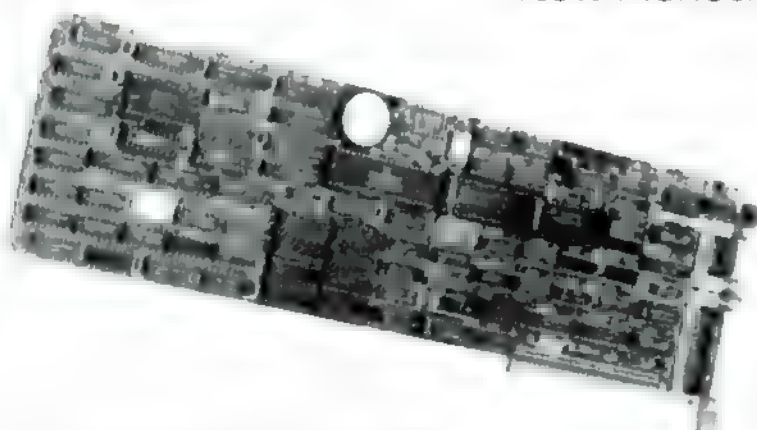
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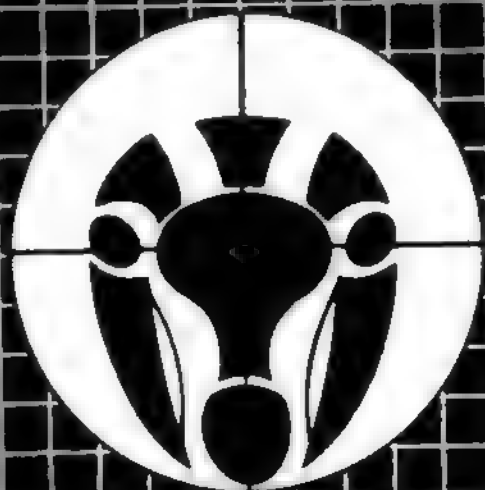
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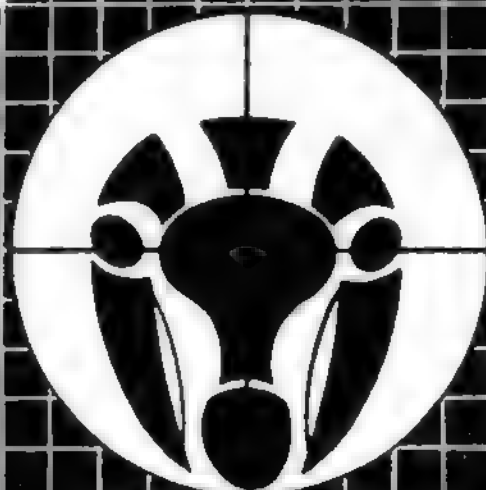
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CIRCLE 126 ON READER SERVICE CARD

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We're Clean

If you're one of the many computer users who are struggling to go straight on software ownership take it from someone who's already there—you're traveling in good company.

We're clean.

I've wanted to open this column with these words for some time now. On the one hand, it was easy. On the other, it'll take diligence and effort to stay clean.

We finally own all of the software that we use for our daily work: the word processors, the database managers, the occasional spreadsheet. I'm less proud of the fact that we're clean than displeased with the fact that we weren't. But we've been growing steadily, adding people and machines. As we added machines, illicit copies crept onto many of them.

Given *PC*'s position and working relationship with software publishers, I'm less concerned about prosecution than persecution. We really don't need the enmity of these people, and we owe them the respect that their labors are due.

It's altogether too easy to overlook the software side when you order up a new computer, figuring that you'll make copies just to get the person started and add legitimate software later. The average user, as I've pointed out before, absorbs software the way a potato chip absorbs moisture on a muggy day. He does it with hardly more malfeasance than the potato chip; the stuff just seems to appear out of nowhere. Controlling it is a major task.

The cynics among you will say,

"Well, listen to goody two-shoes. There he sits, up to his neck in PCs and software, and he's preaching about how we should stamp out copying in our firms."

Yes, we are up to our neck in PCs.



Bill Machrone

And compatibles. And software. I can walk over to the Toy Shop (our test lab) and pick up just about any word processing program that you could name, but frankly, this doesn't mean much.

Can you imagine the chaos if we all used different word processing packages? Or worse, different database managers? So we standardize, and we buy the additional copies we need to get the job done.

Like that potato chip, we never intend to accumulate illicit copies of soft-

ware. Instead, our behavior was a faint echo of Sir Edmund Burke's immortal words: "In order for evil to succeed, it is necessary only for good men to do nothing." I'm pleased to report that we are now doing something and that our management accepts the idea (indeed, it never thought otherwise) that acquiring sufficient software is part of the cost of doing business.

Everyone at *PC* shares these sentiments. And to make sure that we're all pulling in the same direction, I issued the following memo:

To: PC Editorial Staff
From: Bill Machrone
Subject: Software Copies

As you probably know, Ziff-Davis is an active supporter of the Software Protection Fund, an association of software publishers and manufacturers. Its charter is to educate the public about software piracy and copyright infringement.

We at *PC* must do our part in reducing the incidence of these activities by policing our own actions:

1. If someone asks you for a copy of a program or documentation, tell him no. Whether it's for business or personal use, the answer is still the same.
2. If you're using software on your machine for which we do not have an

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EDITOR'S SCREEN

original program disk or other clear title, please let me know. We will buy you what you need.

3. Don't allow evaluation copies of soft-

ware to accumulate on or about your machine. When you know that you have no further use for a particular program, return it to the Toy Shop li-

brary and erase any copies.

4. Be serious. What software products do you really need and use? If there's something you want but don't have, don't wait for it to appear one day so you can snare a copy. Ask for it.
5. Remember that our good relationships with the manufacturers are based on mutual trust and professionalism. If we violate this trust, we will lose their cooperation and good will.
6. Don't waste your time and effort trying to defeat copy protection schemes. If you need a copy that badly, we'll buy it. If the scheme is so obnoxious as to interfere with the convenient use of the product, notify the manufacturer.

One of the nice things you'll discover if you need to buy many copies of a package is how cooperative the manufacturers can be. Many manufacturers offer quantity discounts, some of them substantial. The manufacturers know the value of your business, and they'll even compete for it. Acquiring the software you need may cost you less than you might think.

There is also a double reward in having legitimate copies for all employees. One of them is almost obvious, and the second is subtler:

First, your employees will be more productive if they have their own set of documentation. They may begin using features of the software that they didn't know were there. They'll also have the right to use technical support phone numbers and receive upgrades that apply to the product in question.

Second, they'll feel that the company really cares about them. There is a definite but intangible benefit in knowing that the company cares enough about what you do to invest time and money in equipping you for your job.

Getting clean: When you get right down to it, it's really kind of simple. And it's not too late, for my organization or yours. ■

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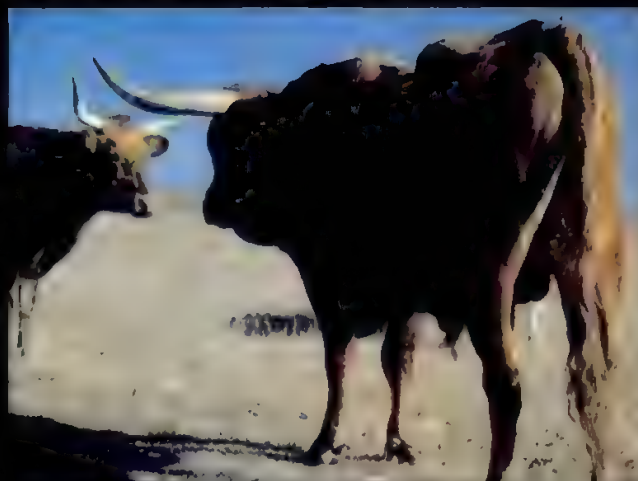
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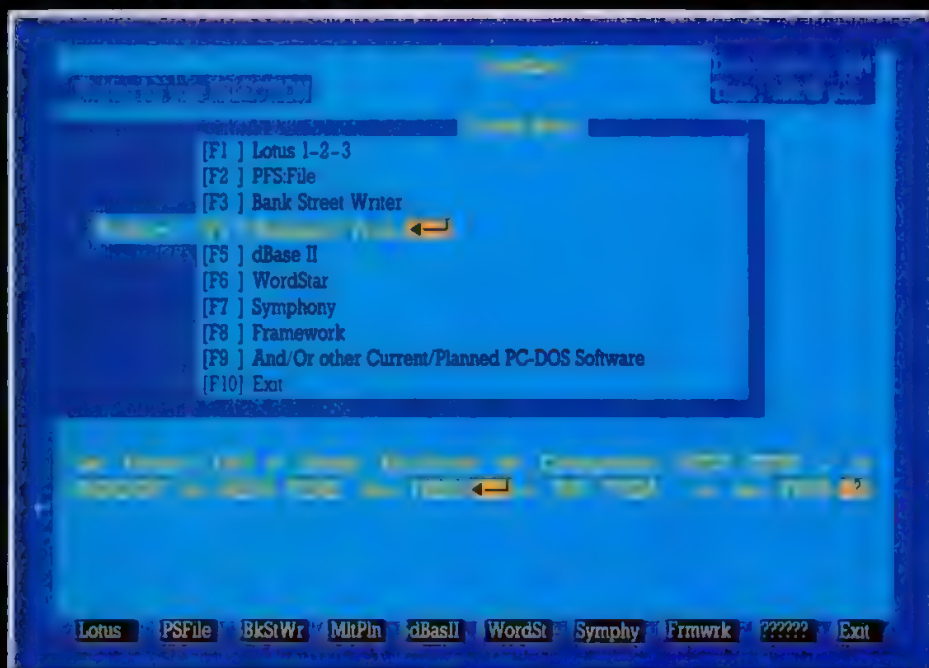
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CIRCLE 461 ON READER SERVICE CARD

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Caveat Emptor

Frantic competition in the market for PC products has created pitfalls for the unwary buyer. Here are tactics for navigating the murky waters of the marketplace.

Before IBM introduced its PC, choosing a microcomputer was pretty easy. The range of choices for the would-be buyer was narrow—only a few manufacturers existed, most of them very small. Applications were primitive and main memory capacity was limited.

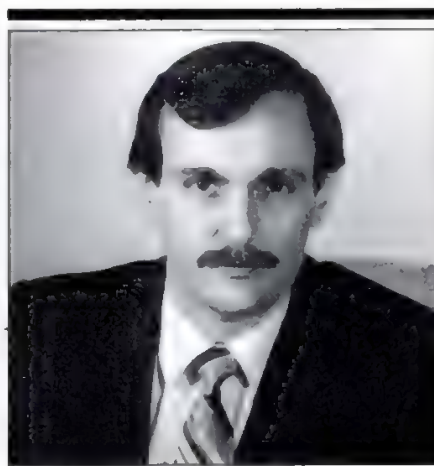
IBM changed all that. Within a year of its appearance in late 1981, sales of the PC led to a growth in the microcomputer industry that exceeded everyone's expectations, including IBM's.

This growth has created a certain chaos in the industry. In a frenzy of competition, many new products were rushed to market half-baked. What used to be a narrow range of choices exploded into a bewildering array of products and new technologies that are difficult, if not impossible, to compare. Pity the poor buyers and users.

The width of this vast market attracted both users and sellers who were naive, first-time participants in the computer industry. Today, anyone—user or vendor—with more than 3 years of experience qualifies as an "expert." Many of these people are now expected to make competent, informed decisions that, ironically, they have neither the tools nor the experience to make.

How can the first-time PC user avoid the "experts" and pick winners? One

way is to look for standards; de facto standards are best. Another way is to buy from IBM or from some manufacturer with whom you've previously had good experience. Many users do so, especially



David M. Allen

corporate customers who are sensitive to long-term support issues. But this strategy can mean missing out on good products not yet available from the "safe" manufacturers—a case of throwing out the baby with the bath water.

Another tactic is to watch major manufacturers and see what direction they're moving in. An example here is the microfloppy. You must choose from three available sizes—3 inch, 3¼ inch, and 3½ inch—and the proponents of each claim that theirs will become the "standard."

But Hewlett-Packard and Apple are already using Sony's 3¼-inch product. The other two contenders have never been used by a major manufacturer in a successful product.

Dealers Choice?

One of the worst approaches is to let your dealer make choices for you. Although many dealers are savvy in avoiding technological pitfalls, most are not and it becomes a case of the blind leading the blind. With many sales occurring through discount and mail-order channels, dealers end up handling whatever sells best, whatever gets the best mark-up, or whatever has been overstocked. In other words, the dealer may not be working in the customer's best interest.

These tactics can prevent a pitfall or two, but consumers won't feel secure when navigating through the market place until they themselves become more sophisticated regarding the computer industry. As long as customers rely on dealers or manufacturers to tell them what to buy, they will be taken advantage of. If customers are informed and can learn lessons from the industry's history, their decision-making will dramatically improve. ■

David M. Allen is president of Tallgrass Technologies Corporation.

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Letters to PC

Added Notes for 1-2-3

Editor's Note: In response to our April 17 issue (PC, Volume 3 Number 7), we received the following letter from Lotus Development Corporation. It expands upon and clarifies a number of the points made in the ten articles we devoted to 1-2-3 and its many competitors.

We were pleased with your treatment of Lotus as the industry standard for integrated software in the various articles in the April 17 issue of *PC Magazine*. We would like to clarify some minor technical points made in the articles for the benefit of present and future users of 1-2-3.

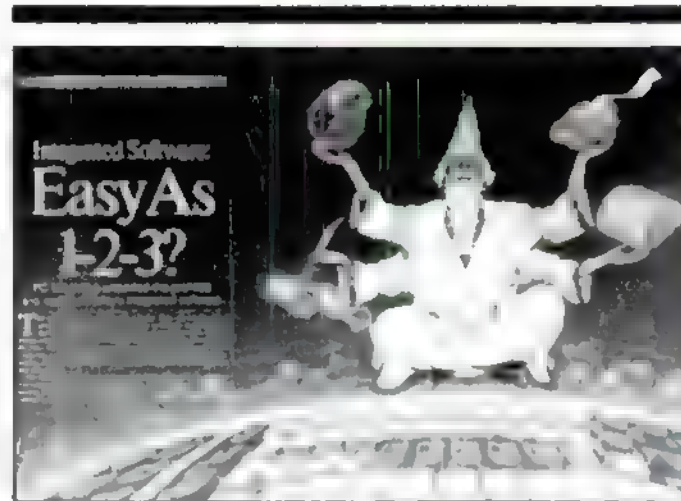
Throughout the series of articles, you use the phrase "color graphics monitor" as a shorthand description of the necessary hardware for displaying graphics. This might be confusing to new readers. 1-2-3 can display graphics on both a color graphics and a monochrome monitor. What 1-2-3 requires is a color graphics board to produce graphs on graphics monitors and a Hercules graphics board to produce graphs on the IBM PC Display (often called the monochrome or text monitor).

On page 125 ("1-2-3 Links Arms with Business"), Stephanie Stallings reports that the user must strike the F8 key to produce a table. This applies only when you want to recompute the table after it has been created, presumably because you've changed a value or formula. When the table is first created, 1-2-3 calculates its values automatically.

Also, the statement that 1-2-3 requires 30 minutes to calculate values for a data table is misleading. For very large tables the calculations might take 30 minutes, but for many applications the calculations run in less than a minute. We ran a 96-row by 5-column table that involved square

roots, squares, sines, multiplication, and addition, and we waited only 13 seconds for the results.

On page 126 of the same article, Stallings explains a method for entering each consecutive month across a row of your worksheet. Alternatively, you might use



the Data Fill command, indicating @DATE(84,1,1) as the start value, 31 as the step value, and a very high number (perhaps 1,000,000) as the stop value. Neither approach will generate month labels unless you have range-formatted your target range with the Date option.

On page 127, Stallings says that keyboard macros are used to sort a 1-2-3 database. Commands that sort databases may be used in macros, but, as with all 1-2-3 commands (except the /X commands), database sorting commands are designed to be used interactively.

Also on page 127, the macro shown as an example needs to be written as follows:

```
{?}
{DOWN}
/XG\A
```

Without the tilde (~), 1-2-3 will misinterpret the /XG command of the macro.

We appreciate the ideas presented in "A 1-2-3 Wish List" (page 127). Here are some thoughts that might be of interest:

Using its Header and Footer options and a short macro involving the Range

Justify command, 1-2-3 can imitate some aspects of a word processor (albeit a very rudimentary one). The macro looks like this:

```
\E {edit}{?}
/rj{right}
{end}{down}
/xg\E
```

If you set column B of the worksheet to a width of 51 and place the cell pointer in column A (its width should remain nine), invoking the macro will put you into Edit mode until you hit the Return key. Then what you have typed will be fit into a 60-space column of the worksheet. You can skip lines by using the cursor keys, and if you end up at the bottom of the worksheet by accident, you can recover by typing <up><end><up><edit>.

"Handing Off Your 1-2-3 Files," on page 130 implies that when the Formulas option of the File Extract command is used, only the formulas are written to disk. In fact, the current values of the formulas are also saved.

We recommend that in the "1-2-3 and VisiWord" section on page 130, under the subhead "Creating .PRN file from 1-2-3," the following step should be added:

5a. Using the Options option, select Other Unformatted, then quit.

On page 131, George Hughes says that the user will generally wish to transfer data from 1-2-3 to a database program to be sorted. For many sorting jobs, 1-2-3's Data Sort command will work.

On page 141, in "Armed for Learning 1-2-3," William Howard makes the important point that buying software locally can be safer than buying by mail order. Lotus maintains a policy of distributing only to dealers who sell face-to-face with the buyer for just that reason.

In the article, "Thumbing Through the

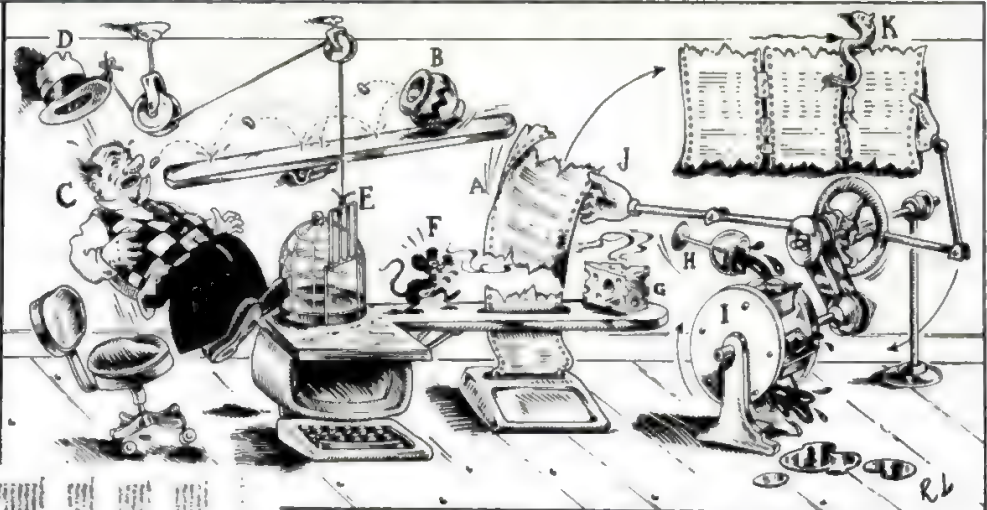
SIMPLIFIED SPREADSHEET ASSEMBLY

RISING SPREADSHEET (A) KNOCKS MEXICAN JUMPING BEANS (B) INTO MOUTH OF NEUROTIC MAN (C) WHO IS SO DISCOMBODULATED THAT HIS HAIR STANDS ON END DISLOPING HAT (D) WHICH OPENS CAGE (E) AND RELEASES EPICUREAN MOUSE (F).

MOUSE, INSPIRED BY SCENT OF PERFECTLY AGED CAMEMBERT CHEESE, GNAWS THROUGH SPREADSHEET, ONLY TO DISCOVER HE HAS BEEN FOOLED BY AROMA OF OVER-RIPE GORGONZOLA (G).

IN A FIT OF PIQUE HE SPILLS VINTAGE WINE (H) INTO WATER-WHEEL (I) WHICH TURNS PULLEY THAT CAUSES GLOVE (J) TO GRASP SPREADSHEET AND MOVE IT TO TAPING AREA.

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LETTERS TO PC

Spreadsheets," the statement on page 145 that macros are worksheet-specific is accurate. However, it is easy to copy macros from worksheet to worksheet, using File-Combine. Once combined, the macros will not work until their range names are assigned. We recommend a format that both simplifies transferring macros and makes them easier to read. Type the macro names and the names of any cells within the macro in the column to the left of the macro, next to the corresponding named cells. Then assign all the range names at once using Range Name Labels Right. After the macro is combined into another worksheet, the same command sequence can be used to reassign its range names without referring back to the original worksheet.

The section about "Putting Spreadsheets Side by Side" beginning on page 146 says that 1-2-3 has no visual indication of protection ("Thumbing Through the Spreadsheets"). 1-2-3 displays unprotected cells at double intensity. It is true that there is no indicator of whether or not protection has been enabled.

The chart on the same page says that 1-2-3 is unable to display formulas in its worksheet. However, the Worksheet Global Format Text option causes all formulas to be displayed, while the Range Format Text option allows the user to choose which cells he or she wants displayed as formulas.

In "Touching Base with Database Managers" on page 152, the E (extract) and U (unique) commands are described first as copying, then as moving. In fact, they both copy records from a database to a target range. The U command is intended to be used with selected fields to determine what field values are represented in the data. For instance, from a listing of all the branches of a New England-based bank, one might like to determine what counties have branches. U (unique) copies each county name only once, no matter how often the name occurs in the database.

In the same article Glenn Hart says that

for lack of a programming language, 1-2-3 is not a relational database manager. One of the features that make 1-2-3 so powerful is its keyboard macro facility. That, coupled with its ability to refer to cells and ranges of cells by names instead of by cell addresses, allows a sophisticated user to imitate most relational capabilities, albeit only within a single worksheet.

In "SuperCalc³ Grows on You," on page 175, mention is made that 1-2-3's macros facility is not capable of working across files. But in fact, using the Range Erase and File Combine commands, a 1-2-3 macro can combine a file, print it, range erase it, combine a second file, and so on.

We appreciate the extensive coverage of 1-2-3 in the April 17 issue. The information we have included in this letter should be helpful in keeping your readers even better informed about 1-2-3.

Daniel Gasteiger
Technical Communications
Lotus Development Corporation
Cambridge, Massachusetts

One Mac for Sale

Having owned many microcomputers (four brands and more than ten machines) since 1979 and having worked with five operating systems, I consider myself a qualified computer user. The Macintosh is

FOR SALE:
Macintosh
computer
(make offer)

a toy. Granted, it is full of tricks, but tricks are for kids. Here's a problem sampler:

1. There are bugs in DOS. The disk label "goes away" at times, and it is necessary to rewrite it. The machine can become so confused that a complete shutdown and reboot are necessary. Apple customer service tells me that they have no plans for an upgraded DOS.

2. *MacWrite* is a problem. If you turn the alarm clock on, click to justify both margins, and click the alarm clock again, the computer totally locks up, necessitating a reboot. The program is very frustrating after using such legitimate word pro-

The Macintosh is
a toy. Granted,
it is full of tricks;
but tricks
are for kids.

cessing programs as *LeScript*, *Volkswriter*, *MultiMate*, and even *Scriptit*. *MacWrite* just does not offer the flexibility or ease of the others.

3. The Trash Can feature is unreliable. I've put folders in it, and even though I never empty the Trash, the files are gone the next time I use the disk.

4. *MacPaint* is probably the neatest computer toy I've found to date. It would be best used by pre-high school kids who would otherwise be standing on street corners.

5. The "For Sale" sign is a one-page graphic I created. The computer forced me out of the program five times to save the file to a disk that had 250K of space left on it. I had to make 11 disk changes to save and come back into the folder. In fact, it took 7 disk changes to boot the computer and load a single one-page document, taking almost 2 minutes. The addition of a second disk drive would help, but nonetheless, until the machine gets more memory and a hard drive, it is not useful in a place of business.

Thanks for a fine magazine.

Jere F. Stahl
York, Pennsylvania

Glad to hear of your many positive experiences with the Macintosh. I still think it'd make a great peripheral for my XT. I'll pay the shipping.—Ed.

(continued)

LETTERS TO PC

Crystal Frequency

I am tackling with great enthusiasm the project described by Laurence V. Marks in his article "Getting Set for Real Time" (PC, Volume 3 Number 4). However, I have run into a snag. The parts list specifies use of a 32,768 kHz crystal, the schematic seems to confirm this (32,768 kHz), but the text (page 159, item 4) says 32.768 kHz. I have been unsuccessful in locating a supplier for either frequency crystal.

Could you please let me know what the

Every professional
must decide
when to pay
for the work
of others.

correct frequency is and where I can get one. I am looking forward to having great success with the project and appreciate your inclusion of it in *PC Magazine*.

Peter D. Hardy
Hingham, Massachusetts

Laurence Marks replies:

The correct value is 32,768 Hz. This is equivalent to 32.768 kHz, as correctly cited in the text. The k is used here in the engineering or scientific sense, to mean 1,000, rather than in the computer sense, where it means 1,024.

This is a fairly common crystal, available from several firms that supply hobbyists. It is also used in digital watches. In fact, one individual who had the other parts on hand used a crystal removed from a watch. It worked just fine.

Staying on Top

Gerald M. Weinberg's Guest Editorial raised many interesting points ("The Hidden Costs of Software," PC, Volume 3 Number 10). However, he makes it seem that only "old-timers" need to investigate new things or to choose between buying a program and writing one.

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LETTERS TO PC

I'd like to point out a small error in the piece. He stated that before the federal government set the speed limit at 55, Nevada was the only state with no official top end on the highways. Please add the vast, fourth largest state of Montana to your list of those states with no speed limit. Montana law still states that your day-time speed shall be reasonable and prudent, based on vehicle, driver, and road conditions, rather than an arbitrary number.

Warren-Albert Weber
Great Falls, Montana

Simple Drive Solutions

Paul Somerson's program in the User-to-User section on copying with one drive was great ("One Drive Blues," *PC*, Volume 3 Number 8, page 406). It helped me understand DOS and batch files.

If Somerson writes anything else, please keep me informed.

Merrill M. Knopf, M.D.
Long Beach, California

Paul Somerson and contributing editor Stephen Manes are busy working on half a dozen computer-related books. Look for them later this year.—Ed.

Correction:

An error appeared in "A Trio of Mailing List Managers" (*PC*, Volume 3 Number 9). *CataList*, from Automation Consultants, International, does in fact provide an option for browsing through the data file and retrieving records by name, partial name, or entry number.

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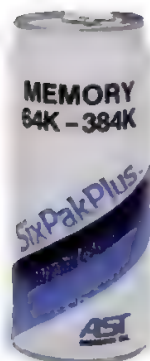
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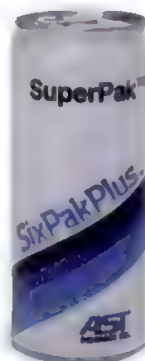
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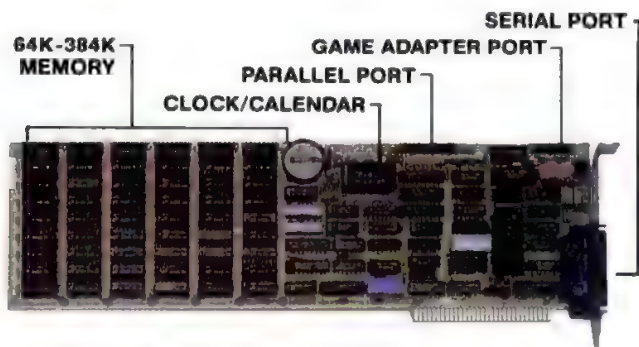
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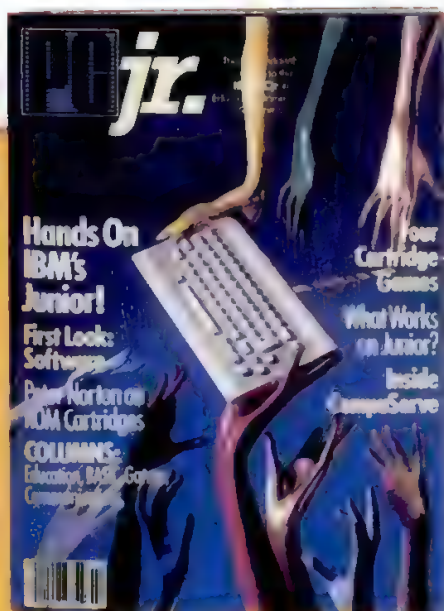
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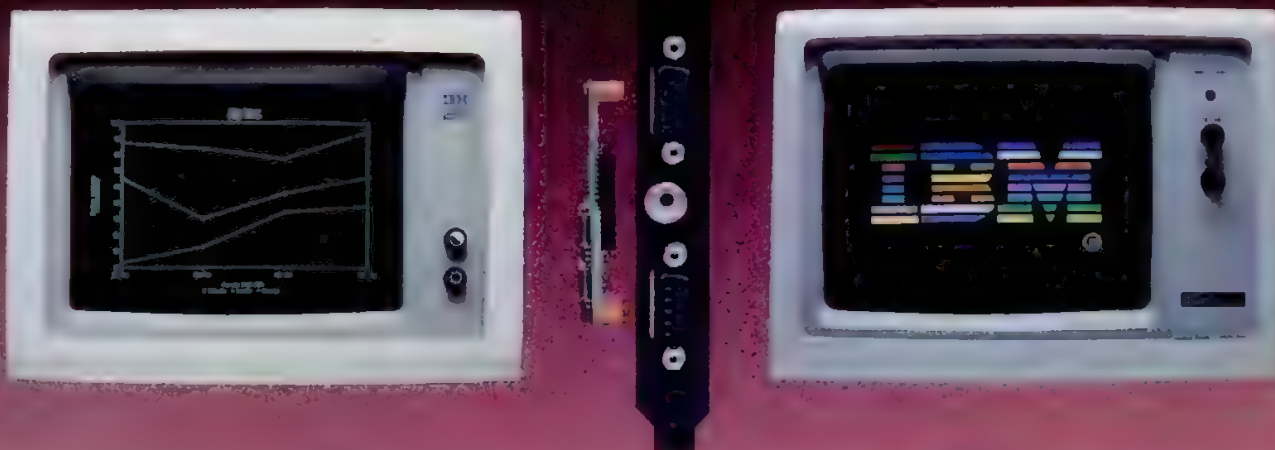
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100% compatible with the IBM Monochrome Adapter Board, IBM's highest quality text mode	YES	YES			YES	YES	YES	
100% compatible with the IBM Color Graphics—for RGB and composite video monitors, lightpen	YES		YES		YES	YES		
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Connect two monitors simultaneously and switch either by software or an external switch	YES				YES			
Graphics resolutions on the IBM Monochrome Display of 720 x 700, includes advanced software support	YES			YES				
Graphics resolution on an RGB Monitor of 640 x 400 with 16 colors, includes advanced software support	YES				YES			
Requires device drivers to operate Lotus 1-2-3 Graphics on an IBM Monochrome Display	NO			YES	YES		NO	
Includes a standard IBM Parallel Printer Port	YES	YES		YES		YES	YES	YES
Operate with a standard television set	YES		YES		YES	YES		

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Missing Pieces of PC-DOS

Norton looks at other manufacturers' versions of DOS and finds several useful utilities that IBM left out of the operating system it customized for the PC.

I've mentioned now and again that some pieces are missing from the version of DOS that we get from IBM.

As you probably know, the DOS that we all know and love comes from Microsoft. It was more or less created specifically for the IBM PC, but IBM didn't manage to acquire sole ownership of it. Microsoft owns DOS and licenses or sells it in various forms to various computer manufacturers, including IBM. The computer maker can then pass on the standard DOS package to its customers, or it can customize the system.

The IBM version of DOS is customized in several ways; it includes several IBM-written programs and slight changes to the way some standard DOS programs work. When you look at the IBM-written programs closely, they have subtle but distinct differences in flavor. You can see the clearest example of this difference in TREE; BACKUP and RESTORE are two other IBM programs with unique aspects.

Obviously, IBM customizes its version of DOS so that PC-DOS can become the official IBM version, not because Microsoft won't do what IBM wants. (IBM can get just about anything it wants.)

Other Versions

Other computer makers have choices to make when they get DOS from Micro-

soft. They can take it in the standard non-IBM Microsoft version; they can, like IBM, modify it to suit themselves; or, like Compaq, they can modify it to function exactly like IBM's version. I've had a chance to see several other versions of



Peter Norton

DOS, so I've been able to learn about the parts that are missing from our version or that were added to other versions. Like IBM, which added the TREE, BACKUP, and RESTORE programs to DOS, some other computer manufacturers have also added a few programs of their own. Most of the ones that I've seen are specific to the particular machine. However, Texas Instruments added two I really like, one for listing and controlling

file attributes, another for listing file sizes with some snazzy features (like listing the total, and telling you if there is room to copy files to another disk).

The manufacturers that added utilities to DOS had the advantage of hindsight in deciding what functions would improve it. I've heard rumors that IBM has contracted for a brief exclusive—perhaps 2 or 3 months—on each new version of DOS when it is first released. Whether or not this rumor is true, in practice IBM's version of DOS is first, frozen long before most other computer makers' versions are prepared. This head start means that IBM users usually get the most bug-ridden version of DOS. We and IBM serve as the guinea pigs; if any bugs crop up, users of other brands of computers may be spared them. For example, back in the days of DOS 1.1, you may have heard of versions 1.25 and 1.26; they were essentially our 1.1 with minor revisions and fixes. The standard version of DOS is now 2.1, but some computer makers are shipping a version called DOS 2.11 that is, for all intents and purposes, 2.1 with a few bugs removed.

What Are We Missing?

In addition to a few extra bugs, DOS 2.1 users are also privileged to get a version with a few pieces missing. Two of them we can cover quite quickly: the

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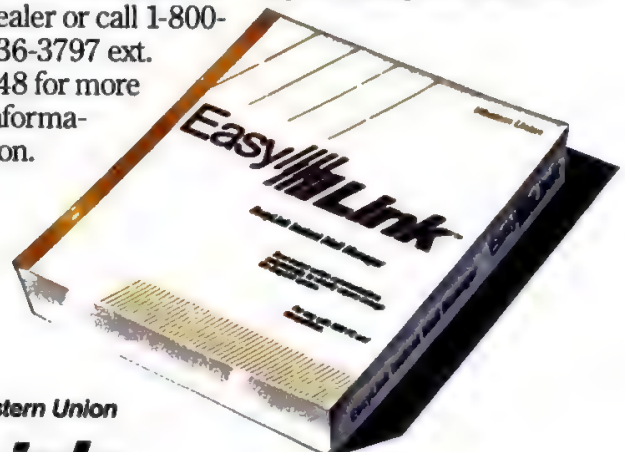
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macro assembler (MASM) and the cross-reference utility that goes with it, CREF. Many computer makers consider these an integral part of DOS and package them with the operating system. IBM purchasers, as you know, must buy the macro assembler separately. But at least if we want it, it is available. Other parts of DOS are harder to come by.

For reasons that are a complete mystery to me, IBM has chosen to remove at least three useful parts of the standard DOS package and simply deprive us of them. They are LIB, FILCOM, and CIPHER. (If you know of any others, please write in and tell me.)

LIB

LIB is an object module librarian that is used in program development to manage separately prepared parts of a program.

If you've used any of the PC programming languages (other than interpretive BASIC), you're probably familiar with library files, which have filename extensions of .LIB. These libraries normally contain assembly language subroutines that are part of the standard support needed by any programming language. Most PC programming languages come with these subroutine libraries ready to use. The language compiler translates our programs into an object file in machine language. It then invokes these library subroutines for some routine functions. After compiling, we link edit our programs using the LINK program. LINK combines our programs' object files (produced by the compiler) with whatever parts are needed from the library to create a finished, usable program.

As you might expect, most programming languages have LIB to create and manage these subroutine library files. LIB will create libraries from scratch, list their contents, add new subroutines to them, remove subroutines (and make them available as separate object files), and also replace the old versions of subroutines with new ones.

If you are doing extensive and serious program development, you really could use LIB to create and manage libraries. It's a shame that LIB isn't included with DOS. There are, however, ways that you can get your hands on a copy.

One way is to buy a copy of the

It's a shame that LIB isn't included with DOS. There are, however, ways that you can get your hands on a copy.

Microsoft C compiler, which comes with LIB. Another way to get a copy of LIB—and a newer, better version than the one that comes with Microsoft C—is with the new Version 2 of the IBM Pascal Computer. Still another way to get your hands on LIB is to buy the latest version of the Microsoft Pascal compiler. It is essentially the same as Version 2 of the IBM Pascal compiler, but it has some additional features.

FILCOM

The next item that is missing from our version of DOS is FILCOM, which is sometimes called FC or FILECOMP. FILCOM isn't an entirely separate program; it's the smart version of the utility we know as COMP. FILCOM has the simple, almost crude features of file comparison that we are familiar with in the COMP program. Like COMP, FILCOM will do a brute-force comparison of files—nice, but not sophisticated. What FILCOM can also do is make an intelligent comparison of ASCII text files. When we turn on this feature, FILCOM will not only report the first difference between two files, it will then search around, trying to find the next place where the files match again. If you are trying to find the differences between

two versions of something, that search-to-match feature is enormously useful. Also useful are a feature that tells FILCOM to ignore the difference between upper and lower case and one that tells FILCOM to ignore differences in "white space" (such as extra spaces and tabs).

These extra features of FILCOM are especially helpful in programming. While many changes in a report or a letter you've written might not matter much, the most minute and hard-to-spot differences in program source code could be critical. It's a grim fact that programmers often keep poor records of the changes they make to programs. If you ever have to track down such changes, FILCOM can be a lifesaver.

CIPHER

The last of the three missing programs is CIPHER, an easy-to-use file encryption program that we can use to protect our data. CIPHER scrambles our files based on an encryption key that we give it. After CIPHER scrambles the file, that file is unusable until it's unscrambled. I don't know anything about the encryption scheme CIPHER uses, but I would bet that it's safe against anybody but the CIA. CIPHER is easy to use because the commands are simple and because the process for unscrambling a file is exactly the same as the one for scrambling it. It's fast, too; converting a 100K file takes only 8 seconds. If you have computer data to protect, CIPHER is a handy program that can really do the trick for you.

Although I was able to tell you three honest ways to get a copy of LIB, I don't know of any proper way to come by either FILCOM or CIPHER. I have them only because I have copies of DOS for machines other than the PC, which are not easy for most people to get their hands on. Perhaps if we all complain loudly enough to IBM, it will give us these programs that we were owed in the first place. ■

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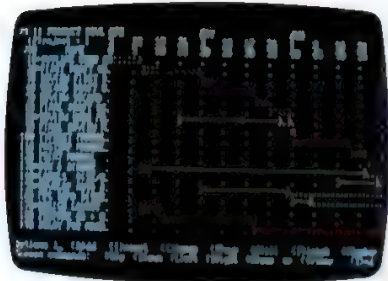
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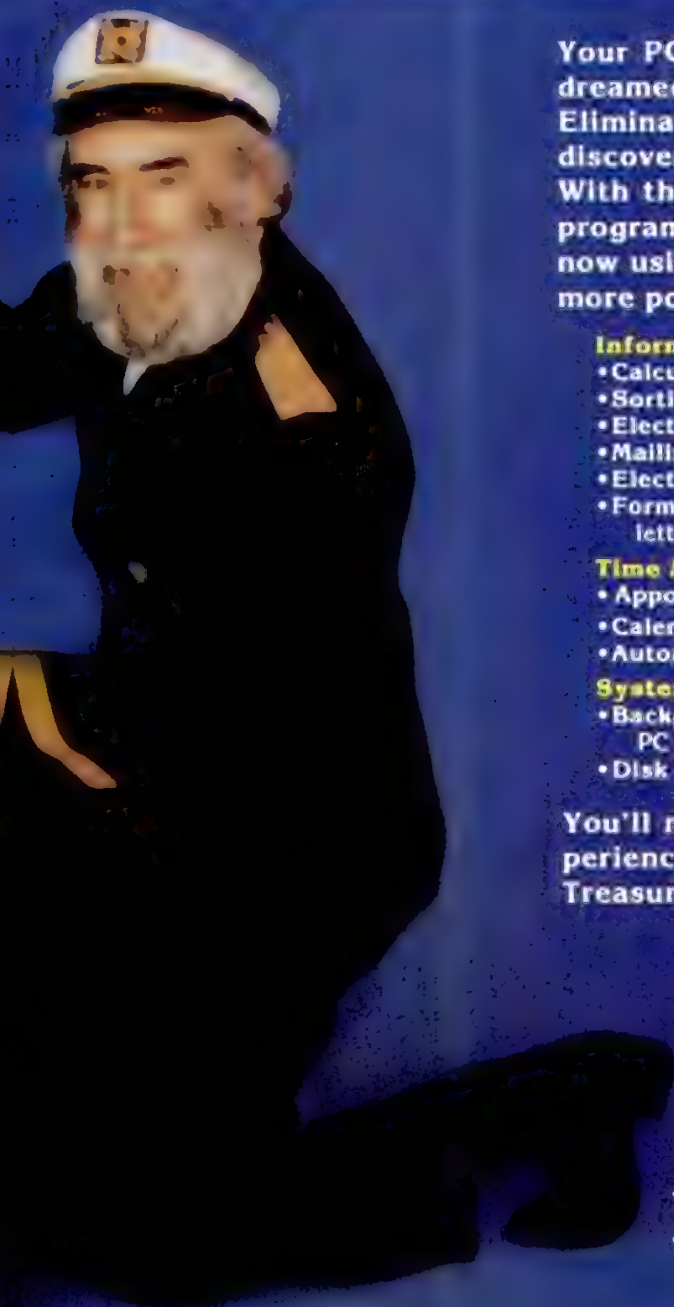
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It has a format mode for tab setting or wraparound and shaping when it's time to write documentation. Pmate lets you assign chains of commands or strings of text to single keys: one keystroke could set up the entire shell of a new C function, for example.

Pmate has variables, if-then statements, loops. It calculates, and converts decimal to hex to binary and back. You can write compact programs (called "macros") to delete comments, for example, or check syntax, or process long sequences of commands. Macros can alphabetize lists, do row and column math, perform a series of operations on multiple files, even summon other macros.

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It's a long list of capabilities which make for an extraordinarily powerful product. In fact, Halo is so good that manufacturers of graphics boards and systems are adopting it as a standard graphics language. So it can bridge your application to other systems. CAD-CAM developers, especially, have embraced its device-independent approach for maximal portability.

Halo is a dazzling demonstration of why C has become the language of choice among programming professionals: its function library architecture means you can tremendously enhance your firepower by acquiring libraries of software like Halo with dramatic economy of time and money.

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PLINK86

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Software is becoming ever more sophisticated, which means more complex programs requiring large chunks of memory. But if you use extra memory, if you count on users to have expanded RAM, you will forego sales to those who do not.

Plink86 is the answer. It takes on the job of shoe-horning large programs into small memory. First, Plink86 acts as an alternative to DOS' Link. For a language like C which encourages design of separately compiled object modules in the Microsoft relocatable format, Plink86 pulls modules together into single compiled programs. But Plink86's overlay power is what has gained it a reputation as a miracle worker. It binds into the compiled program its overlay manager which knows how to swap modules of your large linked program between disk and memory, so that each can temporarily occupy the same memory space.

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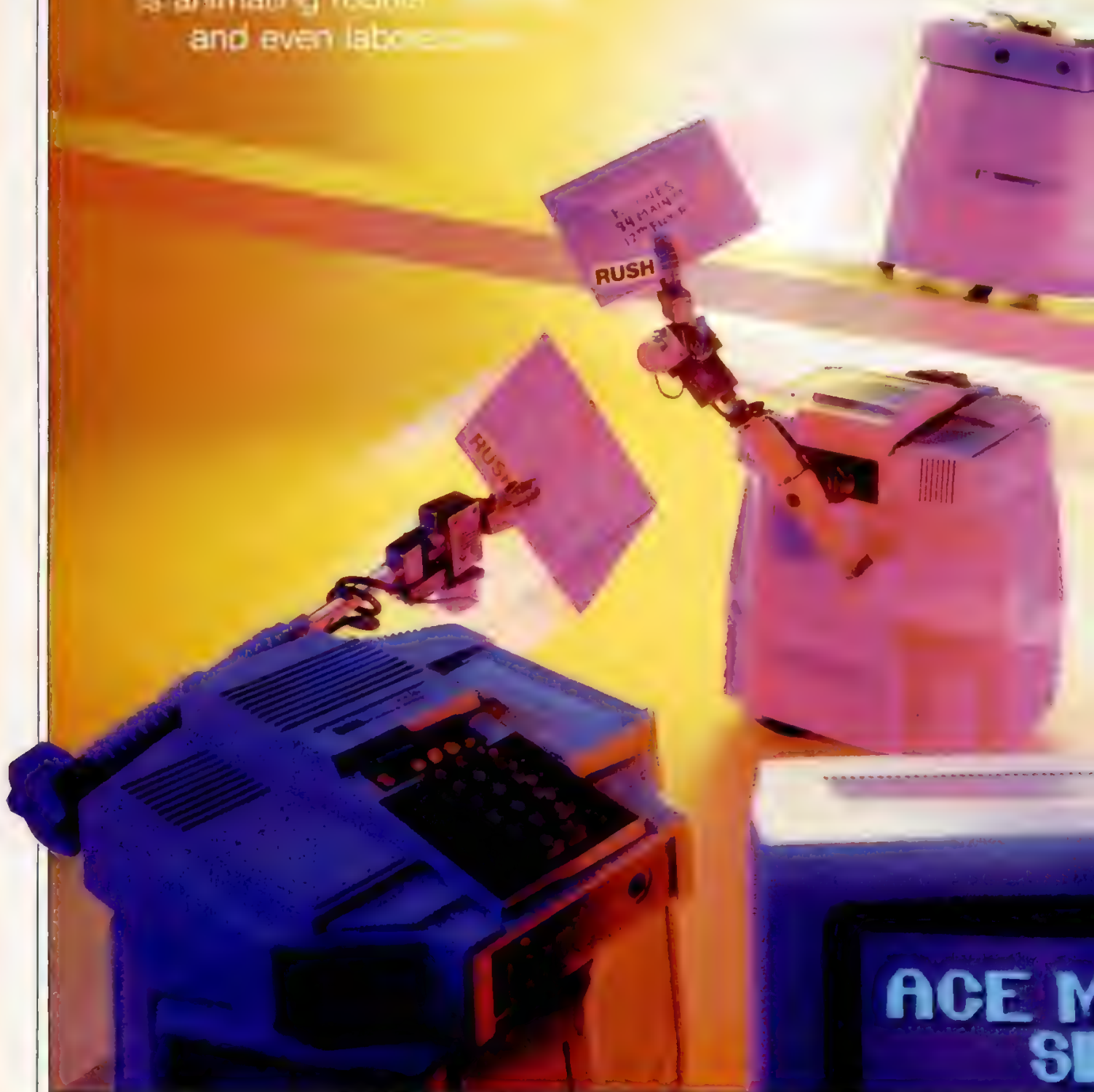
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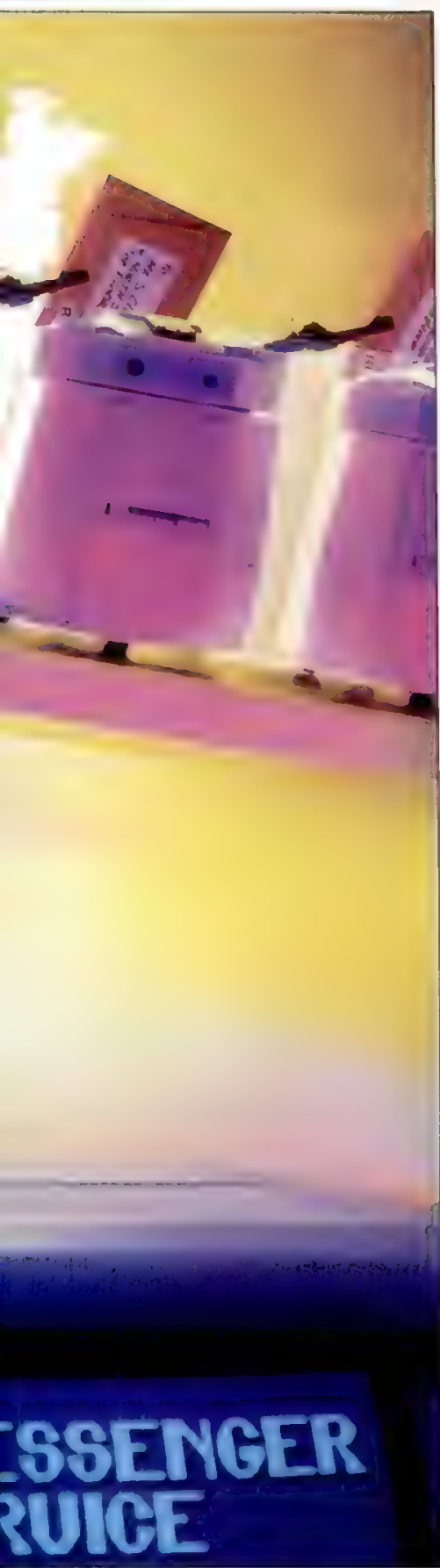
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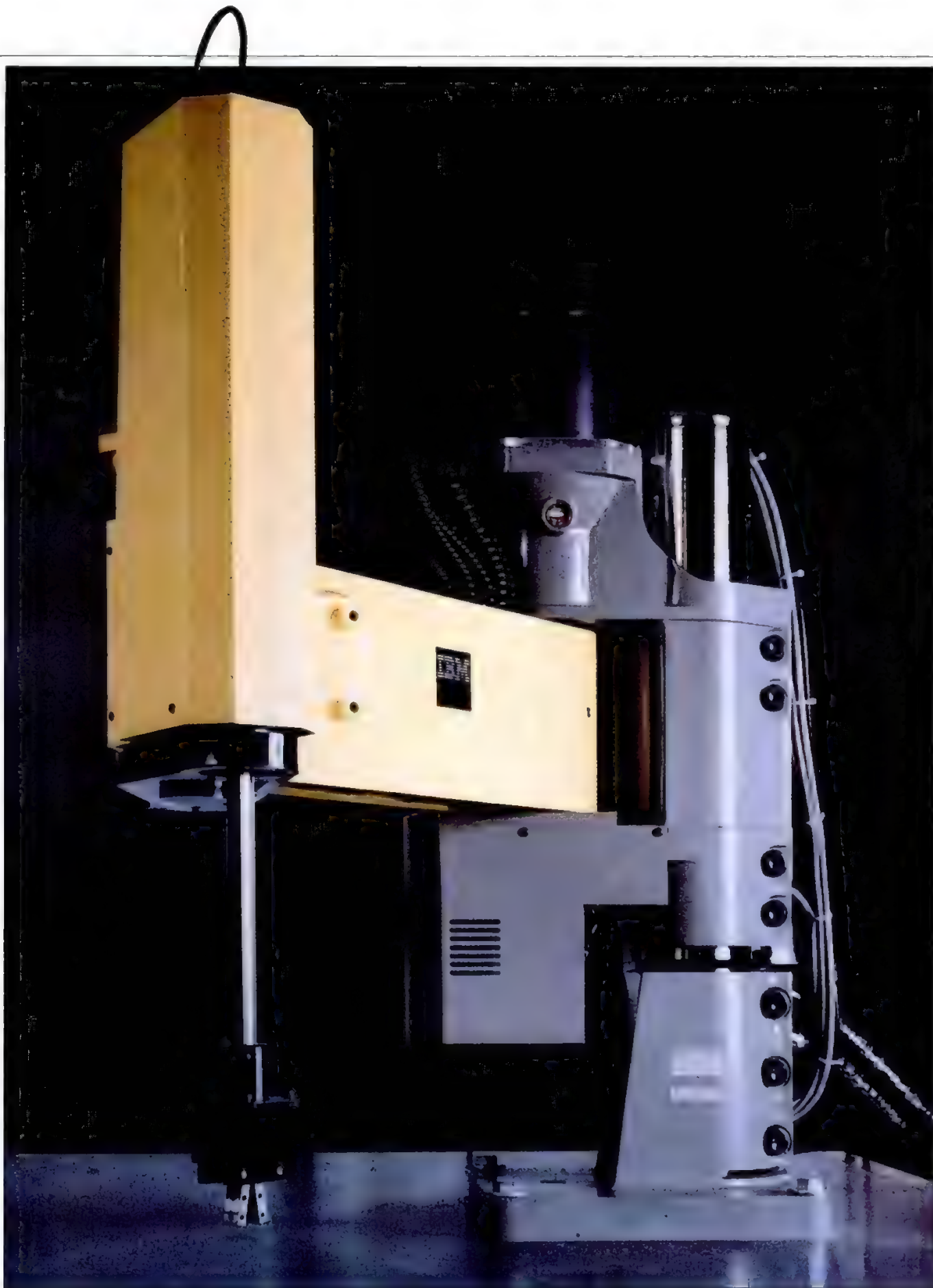
COVER STORIES

NEURAL NETWORKS: ROBOTICS AND PROCESS CONTROL

COVER STORY • BARBARA KRASNOFF

PROGRAMMING FACTORY ROBOTS WITH PCs

IBM has combined PCs and industrial robots to create a moderately priced assembly system that can be easily instructed by novices to do a variety of tasks.



Photograph: Courtesy of IBM

FACTORY ROBOTS

A common thread runs through the history of microcomputers and industrial robots. Until recently, both existed only in the stories of science fiction writers and in the minds of a few scientists and technicians. When the first computers and robots were built, many observers assumed that the primary uses for the machines would be scientific. Neither technology has developed in quite the way the futurists expected.

Microcomputers have indeed become important scientific tools, but they are most widely used in business and industry. Businesspeople are becoming increasingly familiar with the workings of personal computers and are coming to expect them to take over tasks once considered too complex for anything smaller than a mainframe.

Robots also chiefly inhabit factories rather than laboratories, and they are nothing like the humanoid metal creatures made so popular in novels and films (and most of them have not been built by mad scientists). They are becoming increasingly common and increasingly complex, ranging in ability from relatively simple, nonprogrammable "pick-and-place" automatons to "intelligent" computer-driven machines that can analyze visual information and make intricate decisions. Many industries have found that robots cut production costs (they don't get paid overtime), increase efficiency, and result in a more uniform product.

Staying Competitive

More and more manufacturers are turning to robots as a way of staying competitive (the United States auto industry, battling for survival against highly automated Japanese manufacturers, is one example). In response to the new demand, robot manufacturers are concentrating on producing more sophisticated, flexible, and cost-effective machines.

IBM recently combined the technolo-

gies of robotics and microcomputers to produce an industrial assembly system that can be run by an employee without an engineering degree. Its 7535, 7540, and 7545 Manufacturing Systems, which are manufactured to IBM specifications in Japan, use ordinary IBM PCs as "teaching computers" that enable users to create or alter the robots' instructions with relative ease.

The three IBM models fall somewhere in the middle of the industrial robot intelligence (and price) range. Designed for a precision assembly operation, each robot consists of a jointed-arm manipulator and

IBM recently combined robotics and microcomputers to produce an industrial assembly system that can be run by an employee without an engineering degree.

a control unit that gives the manipulator its instructions. The three have somewhat different capabilities. (The 7535 is the simplest.) However, all three can move four ways; they have two swivel movements using the arm joints, a roll-axis movement that swivels the tool it is holding, and a vertical movement that raises and lowers the arm.

These automatons are meant for assembling small to medium-weight products; they are not constructed to handle 2-ton car bodies. They are sophisticated enough

to respond to branch commands or error routines; if a part is defective or an unexpected problem comes up, the robot can receive information about the mishap and choose one of several ways of handling it. The robots' "repeatability factor" is ± 2 thousandths of an inch, which means that they will repeat a programmed action hundreds of times with only that margin of error.

In a typical application, a robot will pick a part off a pallet (a tray divided into distinct areas for each individual part) and place it onto a small revolving disk that moves it past a tester. The machine picks up another part while the first is tested. When a part has finished the testing cycle, the robot picks it up and conveys it to a pallet containing finished parts. If the part is defective, the controller receives a signal from the testing device, and the robot conveys that part to a separate "reject" pallet.

What sets these robots apart from the crowd is that perfectly ordinary PCs with 128K of memory teach them their moves. The PCs connect to the robots' controllers through an RS-232 asynchronous port.

The language that IBM uses to program the robots is called AML/Entry. It was derived from AML (short for A Machine Language), which was originally created for use with IBM's more sophisticated 7500 series robots such as the 7565. AML/Entry is much less complex than AML, which has 180 commands while AML/Entry Version 3.1 has 40 or so.

"Teaching" Robots

AML/Entry is an English-based, menu-driven language. IBM designed AML/Entry for novice programmers. The language makes full use of the PC's function keys, some of which it assigns to the robot's more basic moves, including up, down, and grasp. The screen shows a diagram of the workspace, and a cursor indicates where the robot's grasper is at the

COMPUTER GENESIS

In the beginning there were PCs. And now these PCs are begetting more PCs.

One recurring theme that has caught the imagination of many science fiction writers is the self-replicating robot—a robot that, in effect, gives birth to others like itself, with often nightmarish results. A much less frightening machine, the IBM PC, bringing this dream to life, has recently become a self-replicating computer. At a manufacturing plant in Boca Raton, Florida, IBM is using ordinary PCs and XT's to produce ordinary PCs and XT's.

The factory itself bears little resemblance to the one with gigantic wheels and gears in Charlie Chaplin's *Modern Times*, or the more controlled chaos of an automobile manufacturing plant. In fact, until about a year and a half ago, most of the process control in the factory was done manually, and the plant's machines were predominantly dedicated to getting each PC "kit" to its human assembler. Now, although the kits are still assembled by people, almost all other functions are handled by PCs and an IBM Series/1 minicomputer.

When an IBM PC or XT microcomputer is manufactured, it goes through five phases during its run down the assembly line: assembly, test, run-in, verify, and debug.

The PC kits, which are piles of parts waiting to be assembled, enter the factory area on assembly lines made up of hundreds of metal rollers. They have been placed on the line pretty much at random: a 128K PC (called a PC1) can be followed by an XT (PC2), which in turn can be followed by a 256K PC.

The first thing to do is sort the models

out: the PCs and XT's, the one and two drive machines, and those with increased memories. The first "intelligent" cog in the factory wheel they meet along the line is an IBM PC-XT hooked up to a laser scanner. As each machine reaches the scanner, it is caught and held while the laser reads the machine's serial number. This number allows the XT to route the kit to its assembly point by causing one of the assembly line's metal rollers to raise up slightly, stopping the kit and forcing it down one of four adjacent gates, eventually to end up at an assembly workstation.

In this way, PCs form a vital part of this plant's automatic control system. They are used in several factory locations, and efficiently handle the logistics of receiving and routing the embryo PCs to sorting and assembly areas.

Testing

The PCs not only push their cousins around the factory, they also test the systems to see if they're functional. After the routed kits are assembled by hand, the newly assembled PCs are tested. A PC "captures" the new computer and attaches itself to the machine's I/O. It runs a special diagnostic program that does a complete configuration check to see that all the parts for that model are present and functional. The results are read by the testing PC.

Assuming that all is well at this stage, the new PC is picked up by a Mobot (a robotic assembly machine) and placed onto a "run-in carousel," a large, revolving metal shelf that carries each

PC on a short trip. As it rides the carousel, each new computer goes through a self-testing sequence. At the end of its ride, the computer is removed from the carousel and loaded back onto the assembly line where it is retested by yet another PC for final verification.

Debugging

If a problem is discovered after the run-in, the new machine is immediately rerouted onto the debugging route, which takes the malfunctioning machine to a technician who runs a wand (attached, of course, to yet another PC) across the machine's serial number. The testing PC transmits the information to an IBM Series/1 minicomputer, which is coordinating the entire process. The Series/1 has read the data and has decided, based on probability, where the problem most likely lies. It sends that information to the technician's PC, so that he can replace the appropriate part.

Once the employee has replaced the erring part and has done a thorough recheck of the new machine, it is reintroduced into the assembly line at the beginning of the whole check and recheck procedure.

Until recently, IBM technicians were doing most of this testing manually. One of the three testing lines at Boca Raton has now converted to total automation, and the other two are expected to follow in September. Although human hands are still assembling and replacing parts of new IBM PC microcomputers, more and more responsibility is falling on the PCs themselves.—B.K.

FACTORY ROBOTS

NEW HARDWARE PROMOTES THE PC TO ABSENTEE FOREMAN

Two hardware companies have developed different approaches to letting the PC take long-distance control of the factory floor.

While it may be possible for PCs to spend time in the clean conditions of a factory that produces electronic equipment, it is not wise to use a microcomputer in more typical manufacturing environments. In cases where companies wish to use their PCs or XT's to perform process-control functions, it is usually necessary to keep the computer separated from the electrical noise, dirt, and other hazards of the factory floor. In other words, the microcomputer that controls the machinery cannot be placed near that machinery. This situation has created the need for specialized, long-distance interfaces between the computer and the work place.

RS-422

One solution to the problem is offered by Opto 22, a manufacturer of data acquisition and control equipment. It is

now marketing an RS-422 serial port card, the AC-422, for the IBM PC and PC-XT.

RS-422 is a communication protocol similar to its more common cousin, RS-232. RS-422 differs primarily in the way that electrical impulses move over the wires. Where RS-232 uses one wire for transmission and one for reception, RS-422 uses separate wires for positive and negative impulses in each direction.

The major advantage of RS-422 is its ability to survive transmission over long wires. RS-232 wires are generally limited to runs of 200 to 300 feet, depending on conditions and on the quality of the circuitry at both ends. RS-422, however, is normally considered useful through wires up to 4,000 feet long. This makes RS-422 extremely valuable, for instance, when a printer needs to be located at one end of the factory and the computer that controls it at the other. RS-422 is also widely used in data acquisition, since the protocol allows the various sensors to be located wherever they are needed.

RS-422, however, is not suitable for certain tasks. For example, RS-422 does not support the signaling that a modem needs. Low-end printers, plotters, and other devices have not generally been made available with RS-422 interfaces. Minicomputer equipment, however, often has an RS-422 port.

PC/STD

A California electronics firm called rmac has approached the problem in a different way. It is marketing the PC/

STD Link, two circuit cards connected by a ribbon cable that allows users to link their PCs and peripherals using the company's STD Bus structure.

According to the company, the PC/STD Link employs a direct parallel data path that is capable of providing a connection at direct-memory-access speeds between PC software and peripherals up to 200 feet away. By using the bus, which interfaces with a factory's automation, a PC can monitor and control a variety of process systems in the computer-dangerous environments common to manufacturing plants.

According to rmac, the PC/STD Link includes a PC interface that connects to the PC's I/O, an STD bus control interface, which directly controls and monitors the bus signals, and mailbox ports that handle high-speed PC-STD data transfers. The link also isolates the PC from electronic interference and provides data-parity checking.

The company strongly promotes the use of PCs in conjunction with manufacturing equipment and is marketing a bus enclosure, called Mac Pac, that houses up to 12 of their STD Bus circuit cards, a power supply, and a cooling system.

Considering the versatility and popularity of the IBM PC, it's likely that manufacturing industries will be using more and more in the manufacturing process. By producing new interfaces through which the PC can be involved in process control, hardware manufacturers are benefitting both their customers and themselves.

—Jan Young and Barbara Krasnoff

FACT FILE

AC-422

Opto 22

15461 Springdale St.
Huntington Beach, CA 92649
(714) 891-5861

List Price: \$155

CIRCLE 745 ON READER SERVICE CARD

PC/STD Link and Mac Pac

rmac

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Capitola, CA 95010
(408) 476-9637

List Price: \$1,295 each

CIRCLE 746 ON READER SERVICE CARD

same time that the robot is moving.

Before writing a program, you first experiment with the robot's movements on-line using menu functions, simple English commands, and function keys. The robot can be moved from spot to spot, as well as up and down, and the manipulator can be opened and closed. AML/Entry keeps careful track of where the robot is going; the on-screen graphics help you do the same.

Once satisfied that the automaton is doing what is intended, you can write the program that will guide the robot automatically, inserting the spatial coordinates that AML/Entry has generated into the program by pressing a function key.

AML/Entry has many safety features that prevent you from giving the wrong commands to the wrong robot. For example, if the robot or the controller isn't turned on, the system will immediately signal. If the system has already been configured for a different robot than the one in use, it will also signal and offer you the option of either changing the configuration permanently or changing it only for that work session.

After creating or editing a program, you compile it using menu choices. The program then creates a file that the controller can read.

According to IBM, once a robot is "taught" its job, the PC can then be removed from the factory floor and returned to its normal office duties. Unless a change in programming is needed, the robot's controller takes over.

The PC can also act as a host computer for a robot. The host program, which is written in BASIC, enables the computer to load programs for the robot, monitor conditions, parts, and counts. For example, the PC can become a process controller by holding in its memory different instructions for up to five separate jobs. The PC controls which job a specific robot should do, or which robot should perform

a particular function. It can handle up to ten robots; any more require a more sophisticated computer.

Logic Units

Several of these robots, along with their PCs, are now in use in an IBM manufacturing facility in Raleigh, North Carolina that produces, among other things, logic units for computer displays. One assembly line has been totally automated since January using five 7540s, one 7535,

Once a robot is "taught" its job, the PC can then be removed from the factory floor and returned to its normal office duties.

and several IBM PCs.

"There's a personal computer at each robot workstation," says Dick Knowles, manager of manufacturing engineering. A workstation is part of an assembly line. Along the line, robots take parts out of delivery cartons, assemble them onto a base-built unit, and then move the unit to the next robot, which does the same thing with another part.

"The PCs do two things," says Knowles. "We use them to program the robots and then download those programs to the robot controller. But they also do all of the station control. They monitor photo cell sensors, issue commands to gates and

stops; in fact, they monitor and control all of the station's activity."

Knowles asserts that although the PCs have been right on the factory floor, they have functioned perfectly. "Of course, this is not a steel mill," Knowles says. "It's a fairly clean, electronic assembly environment. But some of our worries turned out to be unfounded. We have had no noise problems, no electromagnetic interference, or dirt problems. The PCs have performed admirably."

To get the PC off the factory floor, IBM has come up with SIM 7505, a color graphics program that simulates the robot's movements in real time. The idea, according to IBM, is to allow executives to visualize the robot's most efficient path without having to leave their offices to manipulate the robot itself.

SIM allows you to trace the path of the robot arm from its starting point to the pallet that holds the parts and back to where the robot "drops" the part off. Separate graphics in the upper-right-hand corner of the screen show a simplified robotic "hand" or grasper as it picks up, holds, or drops a piece; another graphic shows the grasper's roll (twist).

You can, in effect, test a robot's program. Once you find that program satisfactory, you can load it into the robot for immediate use.

Training

To facilitate use of its robotic manufacturing systems, IBM began a 2-week course for new owners of the automatons at its Advanced Manufacturing Systems facility in Boca Raton, Florida. The IBM Robotic Assembly Institute, which has been in operation for about 2 years, offers its students classes in programming and operating the robots, the role of robots, how to integrate them into the workplace, and other pertinent topics.

The large laboratory connected with the Institute contains 10 IBM robots, both

BUILT TO LAST: THE IBM 5531 INDUSTRIAL COMPUTER

IBM has wrapped the components of an XT system in sturdier cases, added protective shields, and attached a thermal sensor to create a system that's tough enough for the factory floor.

The newest member of the growing PC family is more of a hardhat than a white-collar worker. IBM has recently announced the latest in its series of microcomputers: the IBM 5531 Industrial Computer, a "hardened" machine especially designed for the rigors of manufacturing use.

Although IBM prefers to call it the "Industrial Computer," the 5531 is actually a PC-XT that's been beefed up for the tough demands of the factory floor. The motherboard, disk drives, and adapters (with one exception that I will get to later) are plain-vanilla XT. The key difference is in the packaging.

What first struck me about the Industrial Computer was its color. No longer the familiar light beige, the new machine is a dark cinnamon brown, with the system unit, the monitor, and the keyboard all finished to match. Although hardly a giant technological leap forward, the darker shell does signal some significant differences underneath.

The Industrial Computer monitor is IBM's usual color/graphics monitor, inserted into a larger and tougher case. It features forced air cooling with vents on the back rather than on the top so that the dust and dirt of the factory won't fall as easily into the insides and foul the circuitry. The monitor also features a heavy, replaceable protective plastic shield in front.

The keyboard looks and feels like the standard PC keyboard. The difference, however, is that it is built with an internal membrane that prevents dust and dirt

from gumming up the works inside. Unfortunately, this keyboard can't be purchased separately from the Industrial Computer—at least not for now.

The Industrial Computer system unit is ½ inch taller and nearly 2 inches deeper than either the PC or the XT system units. Inside the cover is a completely redesigned frame with extra bracing and shock mounting where IBM believes it will do the most good. The motherboard is identical to the XT's motherboard. The Industrial Computer is delivered with a color/graphics card, a hard disk controller, a floppy disk controller, and a brand-new multifunction card.

Time and Temperature

The new multifunction card packages a serial port, a parallel port, a battery-powered clock/calendar, and a thermal sensor on a single card. The IBM representative explained to me that the card "saves a port" (as opposed to employing separate serial and parallel cards).

The thermal sensor is intended to protect the Industrial Computer from overheating. It continually monitors the temperature inside the system unit and closes a switch when the internal temperature exceeds the computer's design limits. IBM supplies a machine-language subroutine that reads the switch and gives the user the ability to write warnings into the software. Within 10 minutes of reaching the over-temperature condition, the sensor circuitry will halt execution of all programs, protecting, at least in part, the system unit. Unfortunately, the sensor isn't

able to shut down the computer completely.

According to IBM, use of the sensor-reading software is the user's responsibility. If you run the machine without continually monitoring the temperature, and if the machine gets hot and stays hot for more than 10 minutes, your programs are headed for the big bit bucket in the sky.

The multifunction card is specifically designed for the temperature specifications of the IBM 5531 and, therefore, will not be available for separate purchase.

Other interesting features in the system unit include a plastic cover for the floppy disk drive and hard disk opening. This cover can keep dirt and contamination from seeping in and, with an optional lock, prevent tampering. The system unit also comes with a toughened fan and a replaceable air filter at the left front corner of the system unit.

According to IBM, the Industrial Computer is designed to operate at temperatures between 39 and 115 degrees Fahrenheit. For use in most factories, this is a significant improvement over the 60- to 90-degree limitation on the PC. Remember, however, that this specification is for the system's internal temperature; that means for room temperature, the Industrial Computer may be usable between 32 and 90 degrees, give or take a few. The temperature sensor on the new multifunction board will remove all doubt.

In another important departure from the PC and XT, the power supply in the Industrial Computer is designed to withstand transient voltages as high as 2,500 volts and for as long as 16 microseconds. This



isn't a guarantee that the unit will survive a direct lightning strike, but it is substantial protection against the weird electrical things that can happen in a factory.

The IBM 5531, complete with keyboard and monitor, will sell for \$7,590, and deliveries are expected to begin in the fourth quarter of 1984. But there are limits. The 5531 still contains a hard disk drive and cannot be subjected to extreme levels of shock and vibration. Similarly, it's not explosion-proof, nor is it able to withstand a corrosive atmosphere. Instead, it is intended for use where only minimal care is possible, and it is likely to do very well in those circumstances.

In fact, the Industrial Computer is likely to find a home in many environments that are just a little too harsh for the PC and the XT. Warehouses, farms, and military installations are just a few of the places where this robust computer may be needed. —Jan Young

The specially hardened 5531 is designed for manufacturing environments where industrial equipment can be in close proximity to the computer. It is constructed to resist such common industrial hazards as dirt and dust, temperature fluctuations, shock, and transient high voltage.

the PC-compatible machines, and other, more advanced machines that interface with IBM's Series/1 computer. It is here that prospective and recent robot purchasers can gain hands-on experience in programming—without having to experiment on their own machines.

Mike Yankowski, a staff robotic instructor for advanced manufacturing systems at IBM, regularly teaches incoming students how to maintain and operate one of IBM's small industrial robots. According to Yankowski, it usually takes students about 2 to 3 days to pick up the basics of programming and using the robots. The rest of the course teaches them how to design parts for automation, and how to integrate the robot into the manufacturing process.

"The students are mostly those who will be teaching the robots," said Yankowski, "although a few executives come just to find out what the robot can do."

He says about 50 percent of the students who register at the Institute have never done any real programming before, but come away from the course fully able to handle their new systems. Yankowski added that "user groups" of former students come through the Institute about twice a year to update their skills or simply to say hello to their former classmates.

The microcomputer is just beginning to be integrated into industrial robotics and process control. As yet only a few robots can use microcomputers as hosts and/or programmers, and an equally limited number of manufacturing facilities employ micros to do more than administrative work. However, IBM has made a start with the PCs and the 7535, 7540, and 7545 robots; it may not be long before less expensive, less complex computers can take the place of the minis and mainframes that now run modern factories.

"We're moving toward an age where computers are becoming everyday things," Yankowski believes. ■





COVER STORY • ROBIN RASKIN

PCs, PEPTIDES, AND PROCESS CONTROL

Biochemists at the Merrifield Lab
are relying on a PC's
electromechanical talent
to control and monitor
the synthesis of peptides.

PCs AND PEPTIDES

One of the chief technicians of the Merrifield Lab at the Rockefeller University foregoes the traditional white lab coat. This disk-touting technician is an IBM PC, programmed to create, execute, and monitor the process of peptide synthesis. If it's a peptide (essentially a small protein) you're after, just submit your favorite recipe to this PC chef. It'll store your recipes, mix the ingredients, filter your end product, and shut down its entire operation if any part of the complex process goes awry.

The chemical compositions of proteins are the language of life itself, and synthesizing them requires the most precise of recipes. Remember Chemistry 101? Protein molecules are large, complex, nitrogen-containing compounds that are made by chaining together specific sequences of the 20 naturally occurring amino acids. These amino acid building blocks must be linked by strong peptide bonds.

Automating the Language of Life

In the modern lab, the creation of these "biological sentences" takes place in the mixing vessel of a peptide synthesizer. The synthesizer is a conglomeration of glass beakers, tubes, and valves. It's capable of taking specific amounts of chemical substances from their storage containers, combining them in a mixing vessel, and filtering the end products.

In 1963 Bruce Merrifield, who is the John D. Rockefeller, Jr., Professor of Chemistry at Rockefeller University in New York City, developed a method of solid-phase peptide synthesis. This now-famous technique links an amino acid to an insoluble resin. Alanine, glycine, tyrosine—one by one, these amino acids are coupled to each other while remaining bonded to the resin. The resin is washed with solvent after every coupling, which eliminates all the reactants and leaves the insoluble resin and the newly created peptide together as the end product.

The technique is time-consuming and repetitive. It requires the controlled release of various substances into the mixing chamber, carefully controlled mixing times, and a repetition of various chemical washes, solvents, and reagents. As a manual procedure, the job requires tremendous patience. When Merrifield developed the peptide synthesis technique, he knew it would be particularly suited for automation.

By 1967, Merrifield had developed his own simple, but ingenious, automated peptide synthesizer, a biochemist's ver-



Dr. Don Whitney helped to develop the PC-controlled peptide synthesizer.

sion of a "player piano." Truly digital in its conception, Merrifield's synthesizer was a forerunner to the PC-controlled synthesizer that's used in the lab today. The machine contained a large, rotating drum filled with peg board holes. Merrifield programmed the machine by inserting stopper pegs into certain holes. As the drum rotated, a peg would trip a mechanical relay releasing the proper chemical from its container. To change the pro-

gram, all that was needed was to change the pegs. This machine eventually gave way to a more sophisticated synthesizer, which was recently adapted for use with the PC. "Not only do we make peptides," explains Dr. Don Whitney, a research associate at the Merrifield Lab, "we still look for new processes to make them by." The PC will serve the lab well.

PCs for Process Control

Wherever there's a process, there must be some form of process control. Process control involves monitoring and controlling a piece of equipment. A process control computer must receive input from the external environment and correct or halt the process as necessary.

There are various types of process control. Sometimes a constant activity must be maintained—for example, an oven must be kept at a certain temperature. Sometimes the process must be kept at a constant speed, as on an assembly line. Sometimes, as in the case of peptide synthesis, a sequence of events must be executed. Merrifield's peptide-synthesizing PC must control the release of the chemicals, open and close the valves, control the mixing motor, and monitor all the sensors.

All that's required for process control is some sort of interface with the mechanism that must be controlled. With a little engineering work, PCs can be adapted to "talk" to anything, which makes them prime candidates for the laboratory's Most Valuable Process Controller award.

Whitney, along with Dr. Jim Tam, associate professor at the Merrifield Lab, envisioned a computer-controlled system that would provide the scientist with powerful routines to create peptide sequences. In addition, they were concerned with the PC's involvement in process control. "The key here is for the computer to know when there's an error so you don't ruin your synthesis," Whitney stresses. "If

you are up to 20 or 30 amino acids on your resin and you get a malfunction, you can ruin the entire synthesis. The computer has to be able to shut down if errors occur and tell you where things went wrong."

"Whenever the computer has nothing else going on, it is reading the sensors," explains Paul Silverman, the system's designer from the Rockefeller Electronics Laboratory. The controls help the researcher play Sherlock Holmes. For example, if a sensor does not detect liquid in a chamber where there ought to be some, the computer flashes an error message and shuts down operations. Immediately, the researcher suspects the corresponding valves. A specified-time parameter also acts as a control: if the sensor in the first metering column does not register liquid within the specified number of minutes or seconds, the computer shuts down the operation. Perhaps the nitrogen tank that pressurizes the system is empty or there's a valve malfunction. The computer can't monitor every detail, but it can reduce the number of possibilities to consider in the event of an error.

Hard-Working Hardware

For 5 months, Whitney, a skilled organic chemist and computer enthusiast, and Silverman, a sharp computer engineer with a keen sense of the scientist's perspective, worked together to create the PC-controlled peptide synthesizer. Today the lab can produce complex peptides without human intervention. Scientists can use the computer as a flexible research tool to create and file new peptide recipes. As I spoke with them in their offices at Rockefeller University, the PC was monitoring and controlling away. Opening valves, monitoring sensors, and executing a complex sequence of chemical reactions, the PC was the quintessential technician, providing excellent feedback and documentation as it whirled along.

Silverman's first order of business was

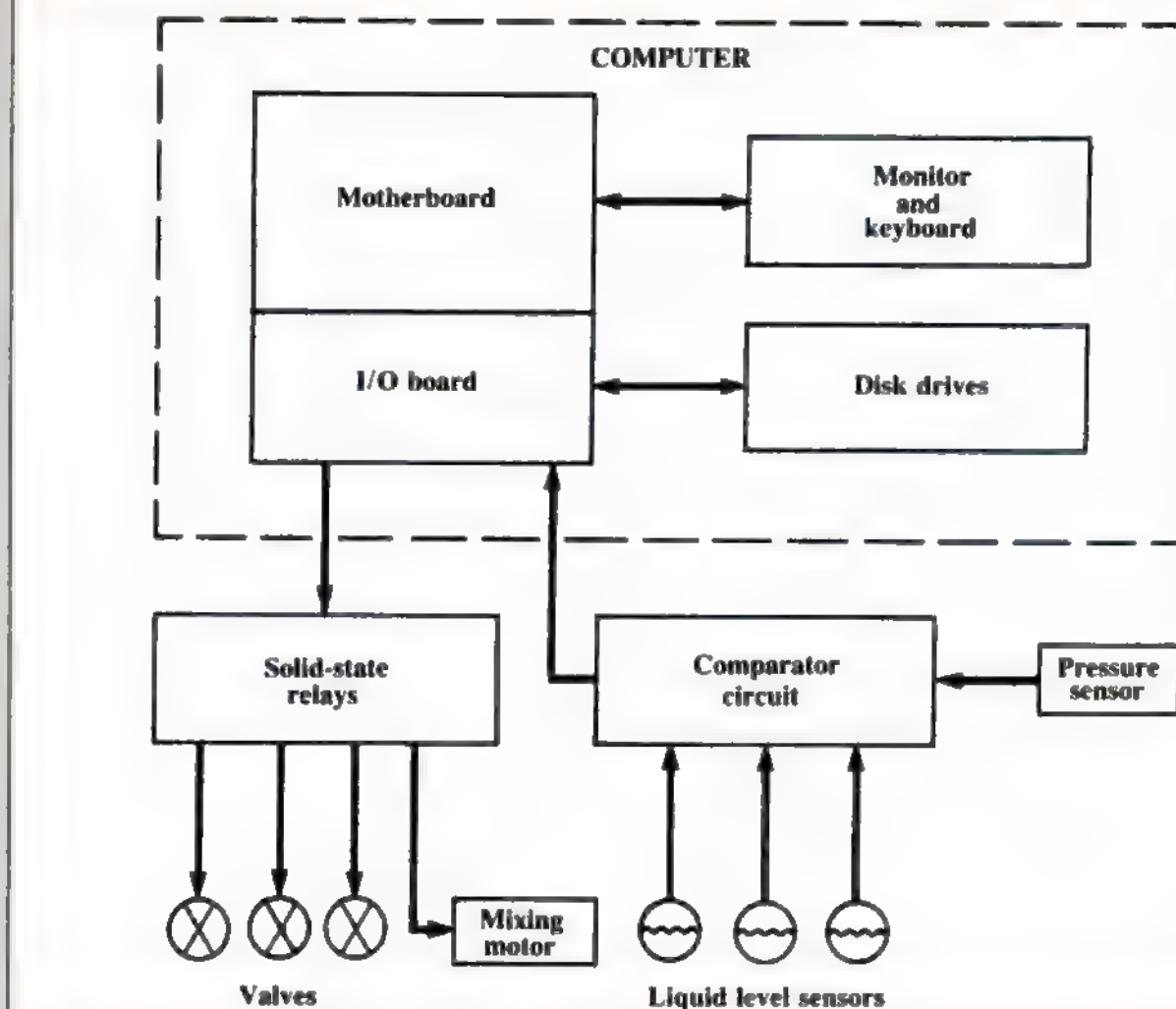


Figure 1: A block diagram illustrating the PC controls for Rockefeller University's peptide synthesizer.

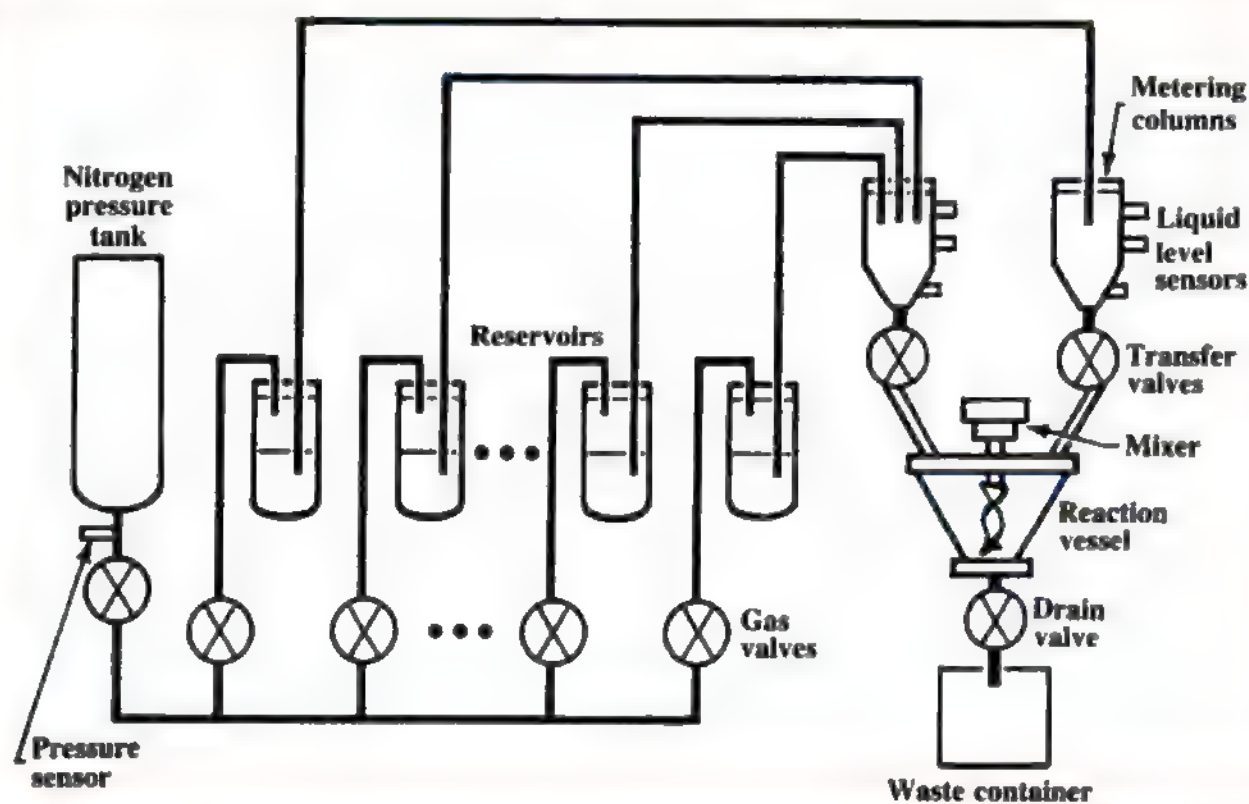


Figure 2: A schematic of the mechanical components of the peptide synthesizer. Peptide synthesis occurs in the reaction vessel. A PC controls the opening and closing of the valves and the duration of the mixing and monitors the pressure and liquid level sensors.

PCs AND PEPTIDES

to gut a commercial Beckman Peptide Synthesizer, an 8-year-old dinosaur that relied on punched mylar tapes to execute the sequence of events. Silverman replaced the Beckman synthesizer's electronic components with a single box containing solid-state relays. The total bill was a fraction of the cost of going out and purchasing a new state-of-the-art peptide synthesizer. In addition to saving dollars, the laboratory gained the flexibility of using the PC as a general-purpose tool.

The lab chose a standard IBM PC, augmented with a Tecmar Lab Master I/O board and a Tecmar Time Master board. The output lines of the I/O board control the relays to the valves and the mixing motor. The input lines monitor the liquid level sensors and a pressure sensor (see Figure 1).

The mechanical components of the old synthesizer were left intact. The mechanical process is straightforward (see Figure 2). Racks of bottles (reservoirs) containing the amino acids and various chemical reagents and solvents are pressurized by a nitrogen valve. These reservoirs deliver calibrated amounts of their contents into metering columns. The columns are equipped with sensors that monitor the fluid volume, and when the desired volume is reached, the transfer valve is opened, which allows the liquid to drain into the reaction vessel and mix with the contents of a second metering column. The resulting suspension is then mixed for a specified length of time and then filtered.

Modula-2 Software

Silverman wanted the program to employ a "hierarchical command language" that would give the biochemists the power to "create new commands from existing ones." He chose the exotic Modula-2 programming language to implement the system. The version of Modula-2 Silverman used translates a Modula-2 program to p-code. The system contains a p-

code interpreter that actually runs the programs.

Silverman carefully designed the program's structure to meet the chemists' needs. "I said to myself, 'What we have is a machine (the synthesizer) that does certain things; it's kind of like a processor. The chemists are kind of writing programs.' I wanted to give them the same tools a computer programmer has." The editor that Silverman built into the program lets the researcher specify new high-level commands by linking together the program's primitive commands. The pro-

Human intervention is not discouraged. When the computer is doing a mixing step, everything can be run on manual.

gram's translator takes this "text" and translates it to primitive codes. The execution of the commands occurs in the interpreter.

Silverman's program uses a menu-driven "shell." The routines allow the user to create new commands from existing ones, to add or remove commands from a file library, modify a command, list the contents of a library, examine the sensor readings, and actually execute the command or series of commands.

The library of commands resides on a single disk, with each command occupying a file. The disk also contains a file with

a directory of commands. The data entered by the researcher occupies a different disk, so different libraries can be used with the same program disk.

Programming Proteins

So how do you say "build me a peptide" in computerese? Each command defines a sequence of actions that the synthesizer performs. For each command, Silverman's system prompts the user to specify the necessary parameters.

The primitive commands correspond to the most fundamental operations of the synthesizer. In Logo, a primitive might be FORWARD or RIGHT; in BASIC it might be SOUND ON. In the programming of peptides, the primitive commands are equally simple. METER instructs the computer to take a certain amount of liquid from one of the reservoirs and deliver it to a metering column. The metering column contains sensors to measure the precise volume. TRANSFER allows the user to specify the number of minutes and seconds that should pass to allow all of the liquid to empty into the reaction vessel before a malfunction is reported. The computer controls the opening of the valves for that length of time, allowing the contents of the two columns to enter the reaction vessel. MIX lets the user specify the amount of time the mixing motor should operate. DRAIN allows the user to set the amount of time that should pass before all the contents of the reaction vessel are filtered out. REPEAT allows you to create a loop that will repeat the process until it reaches END. DISPLAY and WAITFORCR allow the researchers to type comments on the CRT and view them until the carriage return is pressed. In a lengthy synthesis these commands serve as place markers.

Strung together, these primitive commands create a template. Once you define a template in terms of primitives, you don't ever have to do it again. By naming

your template and storing it in a file, you can execute it by its new name. This process ultimately leads to a program that allows you to create a peptide by specifying its name.

The editor was designed to maximize the chemists' flexibility. Once a template is recalled, it is easy to modify any of the parameters. A partially specified template can be recalled and parameters added to make it complete.

I was lucky enough to watch as Don Whitney created a template with my name. So here's the recipe for ROBIN. METER from reservoir 17 until sensor 1 is hit or for 1 minute. Then TRANSFER for 1 minute and 1 second and then MIX for 1 minute. As I watched ROBIN form, I saw valves open and close, liquids fill chambers, sensors blink on and off, and the CRT screen display my program status in easy-to-follow steps.

"I've developed a large personal library to include files like alanine, arginine, aspartic acid. Many of the amino acids contain 100 or more steps," reports a satisfied Whitney. "The system is very compatible with the way a biologist thinks about this process. You slowly build up to higher-level functions. There's tremendous flexibility. I could program the instructions to make a peptide, save it on disk, come back in the lab, put in my disk, and type RUN to repeat the process."

Human intervention is not discouraged; rather, it is facilitated in the PC environment. "If you do a 100-residue synthesis, you need to fill the reservoirs and change solvents," explains Whitney. "We set it up so that when the computer is doing a mixing step, everything else can be run on manual. You can be preparing other parts of the process."

Silverman says that "by providing the chemist with the tools that computer programmers employ, a straightforward approach to control can be realized." He realized his program should be on a "high



Computer engineer Paul Silverman inserts the program disk that contains the commands for controlling the peptide synthesizer.

enough level so that it appears that a peptide synthesizer is being programmed and not a computer."

Reports Whitney, "Last weekend we made two peptides. For a standard solid-phase synthesis, we could complete five or six amino acid residues a day, with the computer running for 24 hours straight." Whitney is enthusiastic about the possibilities of a totally integrated lab. "I can use the word processor and will be using a database program. I have a DNA sequencing program I can't wait to try," he says. It's obvious that this particular PC will earn its keep around the lab.

The Future

"Monitoring for error is one level of process control," says Silverman. "The next level would be to monitor what you are making: the reaction itself. Monitoring

for error is a good/bad type of process. If it's good, you continue. If it's bad, you stop it. Monitoring the reaction concerns itself with things like the product yield. There are more decisions and they are more complicated, but from a programmer's point of view, you only have to add in a few more primitive commands to give the chemists those powers."

"We have to figure out some way to detect the concentration of the amino acid in the reaction vessel," comments Whitney. "The computer part is now simple, but we don't have the instrumentation yet." I suspect the story of PCs and peptides has just begun. ■

Robin Raskin is a free-lance writer who is writing a book for computer engineering students to be published by McGraw-Hill next year.



COVER STORY • MICHAEL MUSKAL

A COMPUTERIZED NOTEBOOK FOR SCIENTISTS

LABTECH NOTEBOOK produces
printouts and graphs and analyzes data
in a matter of minutes.

LABTECH NOTEBOOK

Try to imagine juggling 20,000 oranges in 1 second.

Scientist Michael Wu isn't a juggler, but as a graduate bioengineer at the University of Pennsylvania, he faces a problem of that magnitude all the time. Wu has been trying to analyze the impact of firing 20,000 tiny electric bolts into a cell every second. Researchers in the hard sciences constantly tackle problems like this, problems that require innumerable complex measurements and the juggling of many variables. As technology grows, allowing for the ever-faster collection and manipulation of data, they are struggling to keep pace.

Now the traditional laboratory notebook has been computerized for the PC; a program named LABTECH NOTEBOOK, developed by Laboratory Technologies, is helping Wu and other scientists keep up with their tasks by compressing the entire research cycle into a single computerized process. (Laboratory Technologies originally began as a hardware producer, marketing a scientific computer called the LABTECH 70. But as the PC was upgraded, the company shifted its focus and began developing software for that machine.)

Traditionally many researchers used a digital recorder to record analog data and then played it back to examine the sections they wanted. This method produced a phenomenal amount of data, but, according to Wu, analyzing the information took any-

where from 3 to 4 days of precious research time. Using NOTEBOOK, you can produce printouts and graphs within as little as 5 minutes, and the program can then run through the data analysis in a matter of minutes.

For researchers this program marks a real advance in the scientific process. Projects that once required minicomputers

recalling his days in the laboratory as a chemical engineer. "If you don't have a computer, this takes a lot of time. If you do have a computer, you have to program it to plot the data and that may take even longer. It may be harder to do the programming than to gather the data in the first place."

After gathering the data, he says, "you

Now the traditional laboratory notebook has been computerized for the PC; a program named LABTECH NOTEBOOK, developed by Laboratory Technologies, is helping scientists to compress the research cycle.

can now be monitored by micros, which results in both financial and time savings. Wu uses an expanded PC-XT, a color monitor, a Data Translation board, a printer, and NOTEBOOK software. The entire cost comes in at about \$10,000, compared with \$25,000 for an equivalent minicomputer system.

The Research Process

In developing the program, Frederick A. Putnam, president of Laboratory Technologies, examined the process of scientific research. Because it is composed essentially of constant repetitions, it can be divided into several standard areas, regardless of the type of experiment being conducted. "You collect the data and you immediately want to plot it," he says,

develop some understanding of what has happened in your experiment. You create a model, usually mathematical. Then you have to compare the experimental data with the model and graph that comparison. In most cases, you find that you want to go back and collect more data." The process of trying to bring data and theory into harmony is like the ascending spiral of the German philosopher Hegel, in which nearly every step involves going back to previous stages before climbing to the next level.

NOTEBOOK is designed to compress the entire research cycle so that the data analysis, which can take several months manually, will run in minutes. The program is written in three languages, FORTRAN 77, C, and MAGIC/L, a language



LABTECH NOTEBOOK

Laboratory Technologies Corp.

328 Broadway

Cambridge, MA 02139

(617) 497-1010

List Price: \$795

Requires: 256K, 2 disk drives or hard disk, DOS 2.0, color/graphics board.

CIRCLE 752 ON READER SERVICE CARD

developed by Arnold Epstein of Loki Engineering in Cambridge, Massachusetts. Putnam describes MAGIC/L as a very fast incremental compiler with a clean syntax that avoids the problems of some "reverse polish" languages (languages that use the form "1 2 +" rather than the more familiar "1+2" form). The fourth component of the package is a customized version of Lotus' 1-2-3 (available for an additional \$495), which facilitates graphics and tabular comparisons. *NOTEBOOK* also supports Lotus' recently announced *Symphony*.

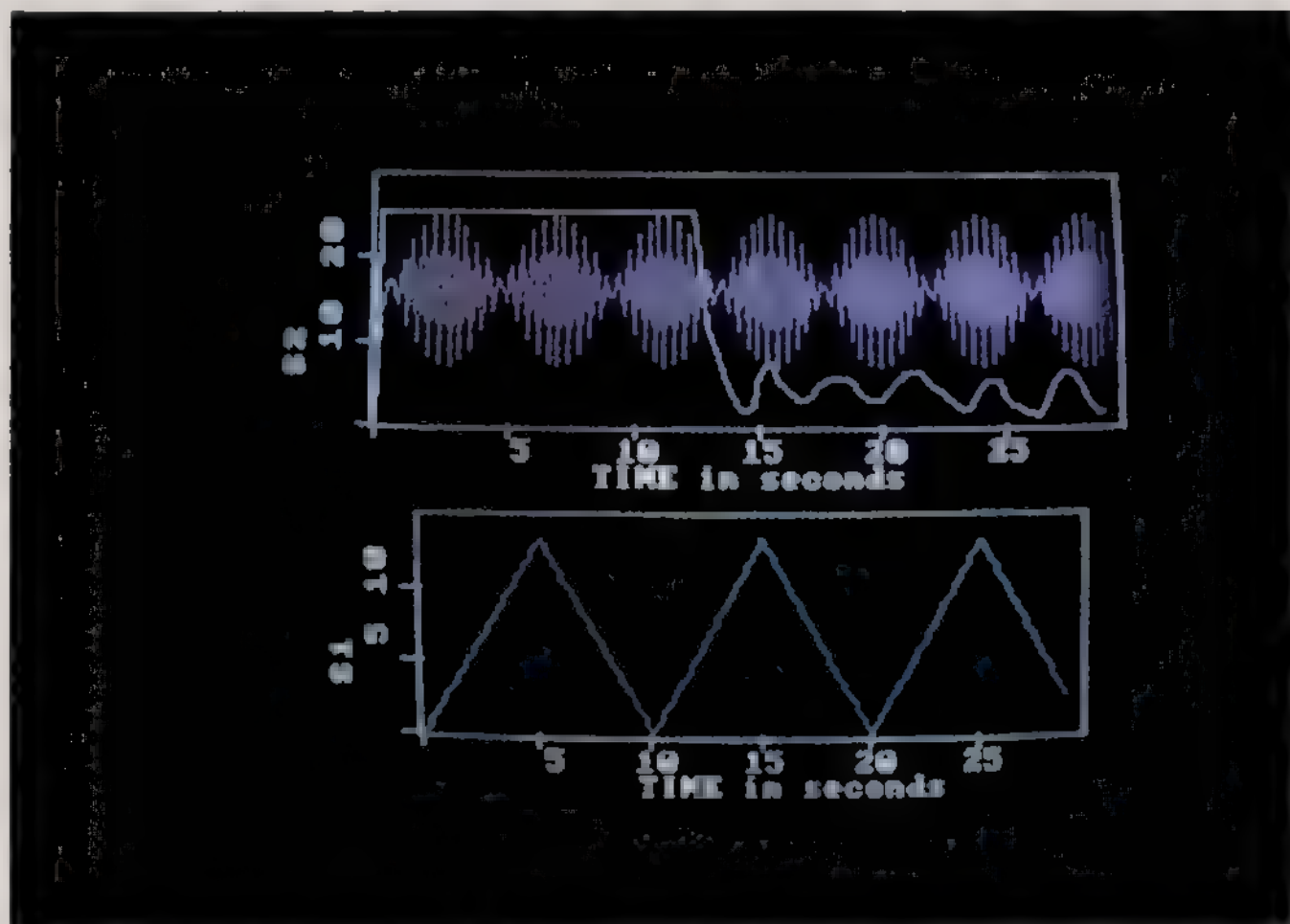
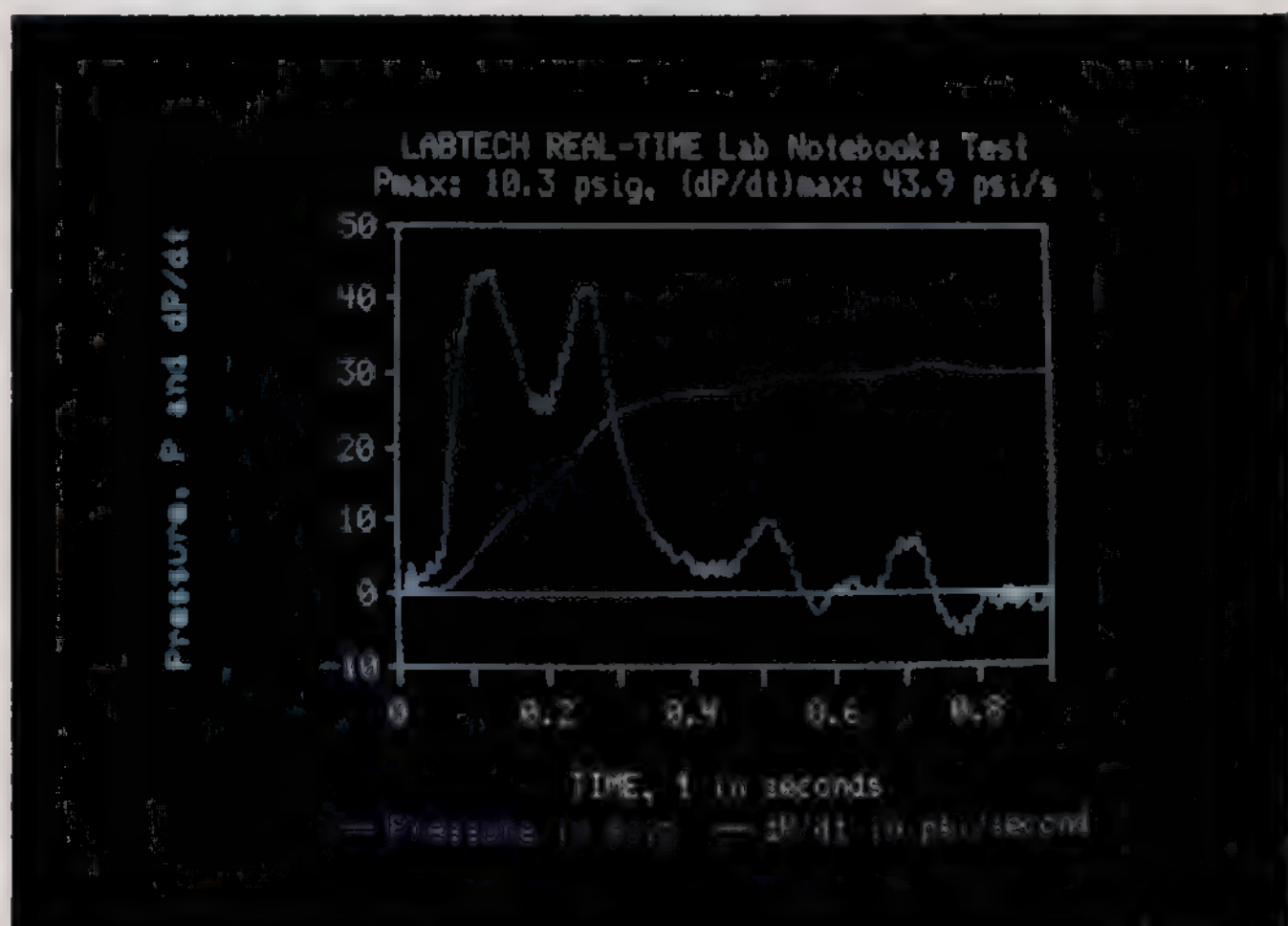
Mouse Support

The program requires a data acquisition board to run. Currently it supports boards produced by Data Translation (to read more about this company, see "Cap That If You Can," *PC*, Volume 3 Number 4), Taurus Computer, Metrabyte Corp., and Acrosystems. Putnam says that Laboratory Technologies is discussing adapting the products of other board manufacturers. For quicker execution, the program also supports the Mouse Systems mouse, which connects to the RS-232 port. Because the software is designed on the IBM PC bit map, it may not run on all PC-compatibles.

In essence, *NOTEBOOK* automates each of the research steps that were once performed manually. The data acquisition board can control the instruments used in an experiment more reliably and quickly than a researcher can; the bit-mapped color graphic CRT is an efficient substitute for the older chart recorders and oscilloscopes used for viewing data; and the computer filing system provided by the 1-2-3 software is easier to use and more comprehensive than paper charts.

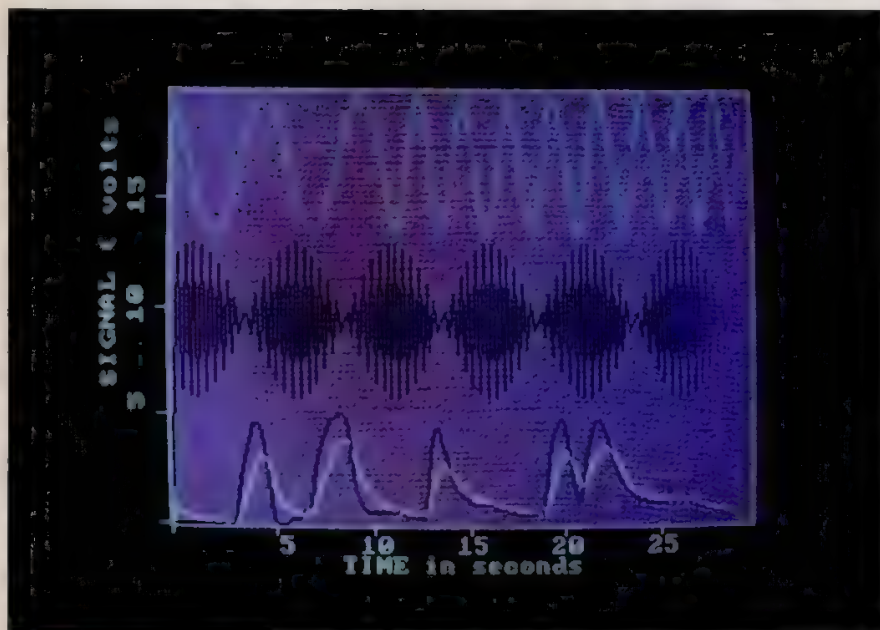
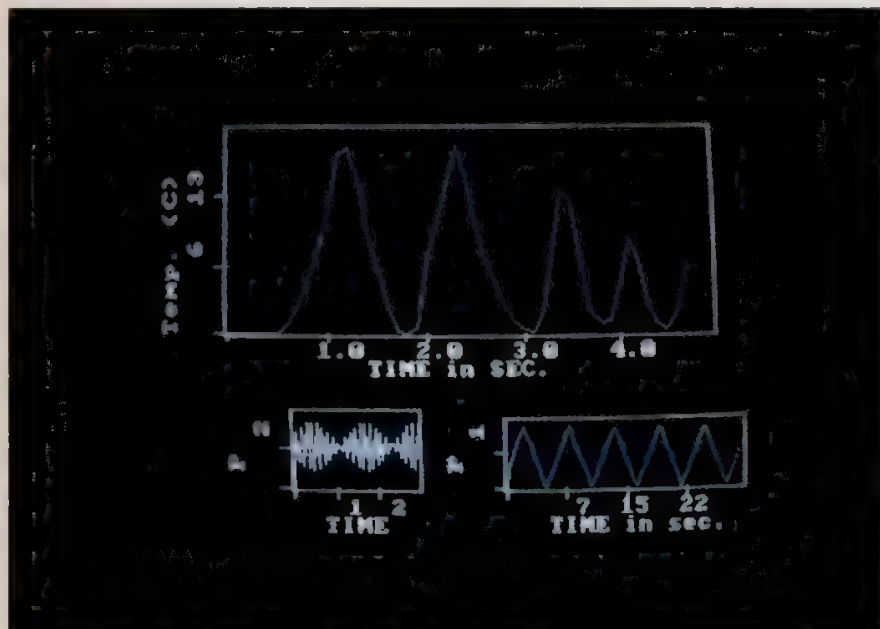
Easy Data Manipulation

Lotus' 1-2-3 also eases data manipulation and statistics with its built-in mathematical functions. *NOTEBOOK* includes a



Above: A 1-2-3 graph of data, acquired by LABTECH NOTEBOOK, that plots time against pressure. The x-axis displays time in seconds; the y-axis measures pressure in pounds per square inch. Below: A LABTECH NOTEBOOK real-time display of incoming analog data.

LABTECH NOTEBOOK



Above: Three windows each show a different incoming analog signal. NOTEBOOK's windowing capability permits data to be plotted on separate graphs, each with its own scale. Below: Four incoming analog signals are plotted on a single graph.

The program is written in three languages: C, FORTRAN 77, and MAGIC/L, a very fast incremental compiler with a clean syntax.

nonlinear regression analysis that is integrated with 1-2-3's graphics, which allows modeling and curve fits so that researchers can test data against a theory. This procedure is sometimes called "fiddling"; scientists often develop their theories by juggling raw data in this way. Putnam asserts that such fiddling will be faster when performed on a computer, which in turn will speed up the research process. The 2.0 version of 1-2-3 also includes an integrated text editor for writing reports and technical papers—often the final step in a research project (and also the first step in getting experimental results published).

With the help of *LABTECH NOTEBOOK*, Putnam hopes, PCs will soon be participating in scientific research even more far-ranging than the applications discussed above. "I think we're on the verge of a major explosion in research," says Putnam. "The PC's penetration of the office is well under way, but that type of penetration is just beginning to happen in scientific and technical areas. Only now is the software finally available." ■

BREAK IT UP

Materials testing is a process any 5-year-old would love: How far can you push a piece of material until it shatters? It's as easy as 1-2-3.

Materials testing is the area of engineering that is most like a 5-year-old's dream: You pull, press, and force a piece of material until it breaks and then note the pressures and the period of time required to shatter it.

One of the first software packages that Laboratory Technologies translated from its LABTECH 70 computer system into the IBM PC format was the *Materials Testing Automation Program*. The transfer was fairly easy because the LABTECH had the same chips and structure that IBM eventually chose for its PC.

"One of the problems in developing software for technical applications," says Frederick Putnam, president of Laboratory Technologies, "is that in any given research lab, everybody is doing something different. But in the area of materials testing, the American Society for Testing Materials has developed standards. We took their standards and coded them."

Materials testing measures the mechanical properties of a solid or a liquid. The Laboratory Technologies software, which costs \$2,995 including a modified template for graphics and comparisons, is loaded into an IBM PC or XT equipped with an expansion card that increases its memory to 320K. A Data Translation data acquisition board is required to control the machine that will actually destroy the test material.

The data acquisition board controls

the testing machine, which breaks the material and sends an impulse to the computer, which notes the parameters. At the moment the material breaks, the time of separation is noted on a comput-

The testing program, based on a customized 1-2-3 template, allows the user to sort breakage data by any criteria.

erized graph, and the software automatically measures and inserts such standardized facts as yield stress, ultimate tensile strength, modulus, specific energy, elongation, gage length, sample diameter, full scale load, modulus offset, and cross head speed. The program provides for both multiple test averaging and data

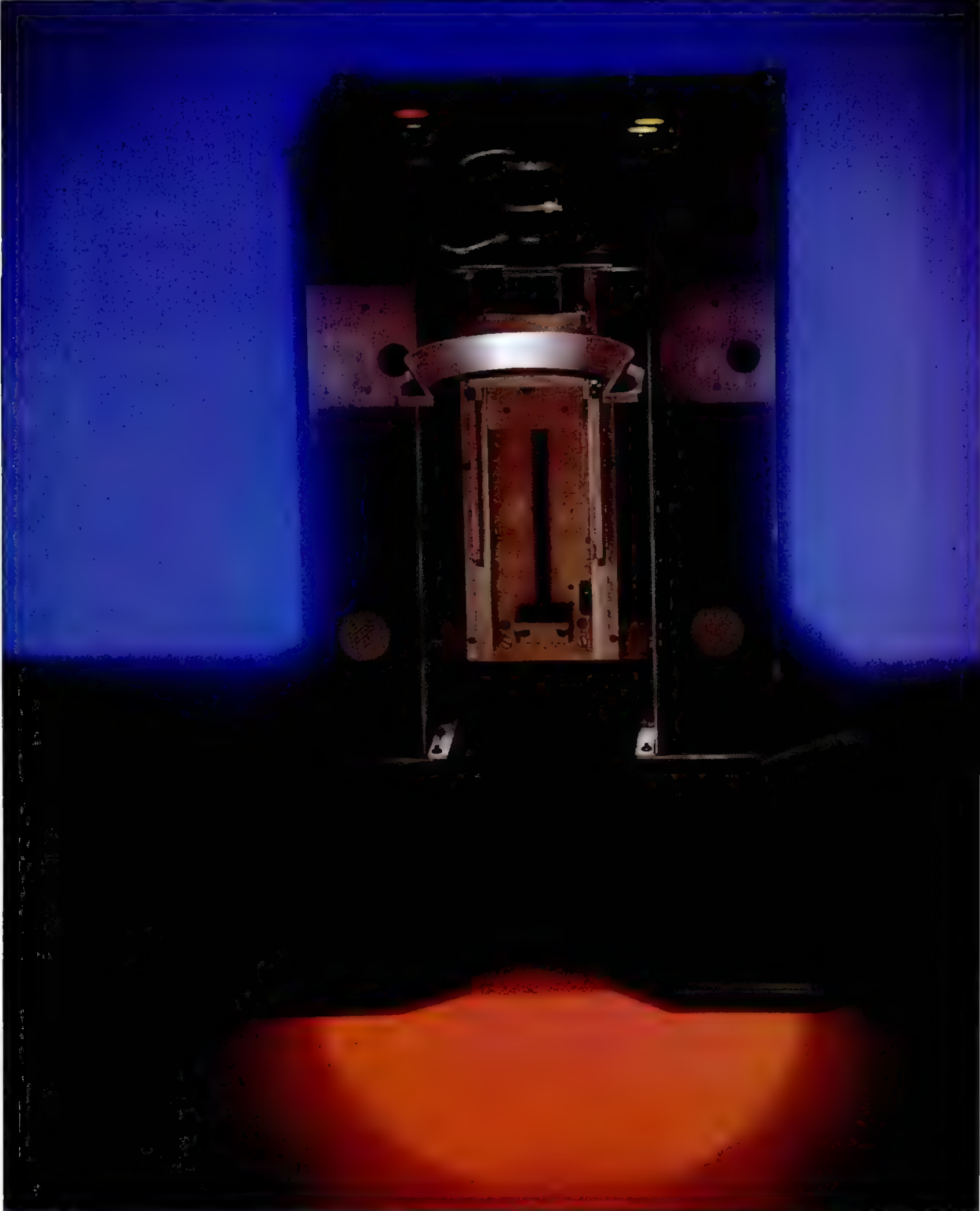
overlays, says Putnam.

Off on a Tangent

Formerly, analyzing breakage data involved finding a tangent to the curve of time versus stress during the test. That tangent must be parallel to a line drawn through the point of breakage. To find that one tangent, the researcher would often move a straightedge ruler around to get the best fit by eye, says Putnam. The analysis of the data also involved computing the area under that complex curve—a task that sometimes meant graphing the curve, weighing the trace, and comparing it to a fixed weight of an already computed area. The manual process could be time consuming; the computerized version takes about 15 seconds.

The testing program, based in part on a customized 1-2-3 template, allows the user to sort the breakage data by test site, operator, or any other criteria. It also includes statistical spreadsheets and supports. The customized 1-2-3 template allows the program to compare tests from different customers, for example, and compute averages and standard deviations. It also allows a company to create formats that are adapted to its particular needs.

Two of the many advantages, says Putnam, are the recordability of the test data and the relative ease with which it can be presented to customers as a finished report. —M.M.





COVER STORY • ROBIN WEBSTER

A PERSONAL ROBOT GOES TO MARKET

BOB can walk, talk, and perform simple tasks. Once outside vendors provide this IBM-lookalike-on-wheels with a few more tricks, you may want to have him around your house.

BOB

Waiting in the wings to make an official appearance sometime in September is BOB, touted as the "first personal/home robot." BOB (that's short for Brains On Board) is either the ultimate in portable PCs or at least one reason why you shouldn't buy that shag carpeting for the living room.

BOB is the 3-foot-high offspring of Androbot, the San Jose-based company. Some readers may remember TOPO, the robot produced by the same company for educational purposes. TOPO was quite short and used wheels instead of legs.

TOPO was brainless; he contained none of the computer hardware that would allow him to make decisions about the world around him. Instead, users had to link up their own hardware before TOPO could do his stuff. But even so TOPO fared pretty well. According to Androbot, over 1,000 TOPO units have been sold.

Androbot's \$3,995 new baby is a different beast entirely. It's taken the Colby Computer idea (repackaging an IBM PC's innards in a portable box) to the extreme; BOB is a PC lookalike on wheels.

Beneath a cream-colored plastic exterior, which looks like it was dreamed up by someone influenced by Buckminster Fuller's geodesic dome concept, BOB uses an Intel 8088 chip and comes with 64K RAM, which can be bumped up to 640K if required. (BOB's exterior may change before the September launch.)

BOB's full name is BOB/XA, the XA

standing for "expandable androbot." And expandability is what this particular robot is all about. Androbot intends to market BOB as a robot prototyping system that comes with just enough hardware and software to make him walk, talk, and perform a few simple tasks. Independent hardware/software vendors will have to provide more advanced abilities.

The main motherboard is set vertically so that it fits into the torso of the robot. There are eight IBM-standard slots for add-on boards. In addition to the regular IBM-lookalike electronics, Androbot has included its own special hardware. A number of sockets can accept plug-in ROM chips, and a selection of specially designed circuits produce speech output, move BOB around, and react to data coming in via external sensors.

Sonar Vision

BOB comes with two head-based ultrasonic transmitter/sensors. These operate in sonar fashion. One sensor sends out an ultrasonic wave and detects any feedback; then the second sensor takes its turn. By computing the time taken for individual signals to go out and return, BOB can determine (using the parallax principle) where objects are located. This ultrasonic setup can be used to great effect during demonstrations of BOB's "follow-me" trick: This robot automatically rolls behind as its demonstrator walks from room to room. Additional ultrasonic sensors can be added for special applications.

BOB also has an optical sensor attached to his waist (designed basically for the same purpose as the bar-code reader in your local supermarket) and moves around by means of two electric motor-powered wheels. Power is supplied to the robot by two 12-volt batteries linked up to generate 24 volts.

A standard pushbutton telephone keypad is used to assign tasks, and somewhere in the final version will be both a

9-pin joystick interface and a 25-pin RS-232 serial port.

Like all good Boy Scouts, BOB has a compass. But this compass is a precise electronic one that allows him to figure out positions and headings. And you'd better stand clear while BOB gets his bearings. I've been told that when booting up under certain conditions, BOB spins like a whirling dervish to calibrate the compass.

The biggest disappointment, perhaps, is that BOB doesn't have an arm in the conventional sense. In fact, he has no gripper device at all. Instead, Androbot has supplied a simple lifting device that operates in the y axis (up-down) only.

This lifting device consists of a small servo-motor that turns a long, threaded rod on which the lifting unit—a U-shaped piece of metal that juts out horizontally—has been placed. The device operates much like those simple screw-type car jacks that have to be turned by hand in order to lift or lower a car. Turn the screw one way and the U bracket will lower; turn it the other way and the bracket will rise, lifting anything that fits snugly in the U.

The reason for not including an arm-plus-gripper on a mobile robot is fairly sound. It boils down to how complex you want to make your software and how many breakdowns (nervous or otherwise) you can take before you get anywhere near to making the arm work well under a wide range of operating conditions.

According to Androbot, BOB's lifting bracket can be used to lift specially designed trays or tables that are placed strategically around a room or house. The idea is that you place items of interest on these trays and, after informing BOB of how to identify these items, he will go off and retrieve them whenever you tap in the correct code on the telephone pad.

BOB currently identifies individual trays by means of a bar-coding system developed by Androbot. Like the lines that tell your local supermarket laser scanner



BOB/XA

Androbot

101 E. Daggett Dr.

San Jose, CA 95134

(408) 262-8676

List Price: \$2495, basic configuration;
\$3995, standard configuration.

Requires: 128K RAM, one disk drive.

CIRCLE 747 ON READER SERVICE CARD

what each item costs, Androbot's bar-coding system uses reflective material to enable BOB, via his optical scanner, to determine whether the correct object is in view. The bar code consists of six digits: one start bit, four data bits, and one stop bit. You can save BOB considerable search time by telling him that an object is located in a different room; the key, though, is to find a way to encode this information in bar-code form and place it on the wall in a prominent place.

BOB can recognize a 2-by-2-inch bar code up to 10 feet away. However, most households have a wide range of items that might produce visual "noise" and interfere with the scanner. I couldn't test how BOB might react to such situations in Androbot's bare-walled San Jose office, but relevant data should be forthcoming when the robot goes on the market.

Sleeping on the Job

I also foresaw some real problems in trying to get BOB to go between rooms that have carpets of differing pile thickness or between split-level floors. In the event that BOB cannot continue because of some physical barrier, he will automatically stop what he's doing after a few attempts and go to sleep. The situation is similar to DOS telling you that, having failed to read a disk track after three attempts, it wants to know if it should "Abort, Retry, Ignore?"—except that BOB seems to be programmed to abort.

Androbot has decided to use the FORTH language to program much of BOB's activity. This is interesting because, technically speaking, FORTH is an ideal language for creating extremely concise code for controlling many types of electromechanical operations.

In fact, this code is so efficient that it is not unusual to find tiny FORTH programs handling data acquisition/hardware control at major radio telescope observatories or unattended radio transmitters. Typi-

cally, the FORTH compiler and associated development software only require about 6K in a stripped-down form, while the final FORTH programs could happily live in a handful of kilobytes.

The drawbacks of FORTH center on the ease with which bizarre programs can be created. Because this language is based on a main dictionary in which "defined" words are stored for execution in programs, the programmer creates his own language. Only a few FORTH primitives

When booting up under certain conditions, BOB spins like a whirling dervish to calibrate the compass.

come ready-defined. One user-defined word may thus include the definitions of many other words already stored in the dictionary. Executing a single word may therefore have a small effect (if that word only represents a one-level definition) or a domino effect (if it represents hundreds of other FORTH words).

This makes FORTH programs some of the most personalized code ever. The source code is usually unintelligible to anyone not involved in the development process, and documenting the code later may be an impossible task for the careless programmer. However, Androbot is said to be developing a high-level program-

mer/user interface that will sit above the FORTH routines. Androbot is hoping that people well versed in the PC's architecture will see BOB as a good way to get into some exciting development work.

Many things could be done to enhance BOB's hardware and software. A bolt-on arm could be added complete with a gripper and the software to control it. Perhaps instead of having to tap in commands on the integral telephone keypad, some kind of remote-control command system could be employed (radio signals or, possibly, spoken words), and maybe decision-making software could be introduced that would elevate BOB from a quite good "follower-of-instructions" to an active "learner-of-new-rules."

A New Market?

In the late sixties and early seventies, there was a gripper-equipped robot called Freddy. He used a camera for an eye and was bolted to the ceiling. His sphere of influence consisted of a movable table supporting some wooden toys. Over time, Freddy was taught how to disassemble and assemble these toys and was able to recognize objects and interact with them by moving the table around to bring things into reach.

One-armed industrial robots have, since Freddy's time, come into widespread use. Intelligent robot design, in contrast, hasn't advanced significantly in recent years. BOB may well be in the vanguard of an emerging personal robot market. The concept of the average person owning a personal robot, however, has yet to gain popular acceptance.

If only a personal robot, or any robot, could do something really intelligent like prepare and serve an extra dry Martini without breaking the glass, cook a burger medium-rare and go easy on the mayo, or amuse you and your friends with a juggling act. When that happens, I'm sure no one could imagine being without one. ■

"I just found the
ideal solution to
my telecomputing
problems. And it's
right here inside my
IBM® PC. *Plus* I got a
free bonus to boot!"



Hayes Smartmodem 1200B™ and Smartcom II™ software.

The complete, easy-to-use plug-in telecomputing system for the IBM® PC and compatibles.

Looking for just the right telecomputing system for your PC? Hayes has it! Smartmodem 1200B and Smartcom II communications software. The most reliable and easy to use modem and software for your IBM PC or compatible computer. At a great single-package value for you. And when you buy now, you'll also receive a valuable free offer. From Hayes, the telecomputing leader.

Smartmodem 1200B. Your PC's telephone.

Everything you need to communicate—computer to computer—is on one, convenient plug-in board. Smartmodem 1200B easily slides into an expansion slot of your PC (your dealer can install it in minutes). You're ready to send and receive information at up to 1200 bps. For speedy, economical transmission to personal computers, data bases and information services throughout North America.

So what could make communications easier? Smartcom II software, designed by Hayes specifically for Smartmodem and your PC!

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COVER STORY • JOHN GOODLET

THE PC INTERFACES WITH A HERO

Micromation's HERO MemCom board connects the PC with the Heath HERO personal robot, expands the memory, and may give PC users a way to easily program the mobile machine.





HERO

About 2 years ago, a small, somewhat unprepossessing robot made its debut in the electronics industry and set off an enthusiastic response that has yet to die down. The Heath Company of Benton Harbor, Michigan, has sold more than 8,000 models of its HERO-1 robot, a programmable automaton that was one of the first mass-produced "personal robots" to hit the market.

HERO is aimed at schools and industry for use as a training robot. It is expandable, comes either as a kit (for those who want to learn robot assembly) or preassembled, and is relatively inexpensive (\$1199.85 for the kit and \$2199.95 assembled). HERO has become popular among educators, industrialists, and hobbyists who want to learn more about and experiment with this new and exciting field.

The robot does have a few drawbacks. It lacks sufficient memory for more elaborate tasks and would benefit from an easier method of uploading and downloading programs. Hooking HERO up to a microcomputer such as the IBM PC could solve both of these problems. Many PC users would doubtless welcome the opportunity to take advantage of this new robotics technology.

A Maryland-based company, Micro-mation, Inc., has just come out with an adapter board that supplies an RS-232 interface and an additional 30K of memory for HERO. While the new hardware doesn't entirely clear the path for full exploitation of a HERO-PC interface, HERO owners should be able to use it to

greatly expand this useful little robot's capabilities.

Before any discussion of the new adapter board, a full explanation of HERO's construction and capabilities is in order.

HERO-1

The Heath HERO-1 robot is a battery-powered, versatile robot that uses the Motorola 6808 8-bit microprocessor as its brain. It has eight independently controlled axes of motion through which it can be programmed to move over limited ranges, much as industrial-quality robots do. It can drive itself around the floor on a tricycle wheel system, turn its head, rotate and extend its single arm, pivot and rotate its wrist, and finally open and close its two-fingered gripper. It will also speak using a voice synthesizer or communicate using a 6-character LED display that can flash a series of individual words to form a sentence. It can detect different levels of sound or light energy, sense motion using a continuous wave ultrasonic beam, and even measure distance using a separate, pulsed beam of ultrasound. What's more, all of these features can be sequentially programmed to form combinations of actions that are limited only by the robot's memory and the programmer's skill and imagination.

If programming is not to your taste, HERO-1 comes with a remote, hand-held teaching pendant or switch box that you can use to drive each axis through a sequence of motions and command the robot to remember the sequence and magnitude of each action.

The HERO-1 robot weighs just under 40 pounds including its accessories and stands 18 inches off the ground. It is shaped somewhat like a truncated, four-sided pyramid when its plastic side and top covers are in place. The assembled robot can be divided into three basic regions: the base or chassis, the torso, and the head.

The Base

The base assembly is supported by a tricyclelike wheel system composed of a front wheel that both drives and steers and two freely rolling rear wheels. A base plate, mounted just above the wheels, contains two motors that drive and steer the robot and one that rotates the head. Three of the four batteries that power the robot are located here. The robot has two sepa-

The HERO-1 robot is able to detect different levels of sound or light energy and sense motion using a continuous wave ultrasonic beam.

rate battery power systems, one for the electronic logic circuits and microprocessor and one for driving the motors. One logic battery is in the head, and the other is in the base. A connector block at the rear of the base contains the receptacle for an umbilical cable for charging the batteries, the teaching pendant receptacle, and two cassette tape recorder connections. The power switch is also located on this cluster of components.

The Torso

The torso is essentially a boxlike sheet-metal structure with a single door that opens to the rear. Seven of the robot's 15



HERO-1

Heath Company
Benton Harbor, MI 49022
(616) 982-3411

List Price: \$1199.85 for the kit,
\$2199.95 assembled.

CIRCLE 743 ON READER SERVICE CARD

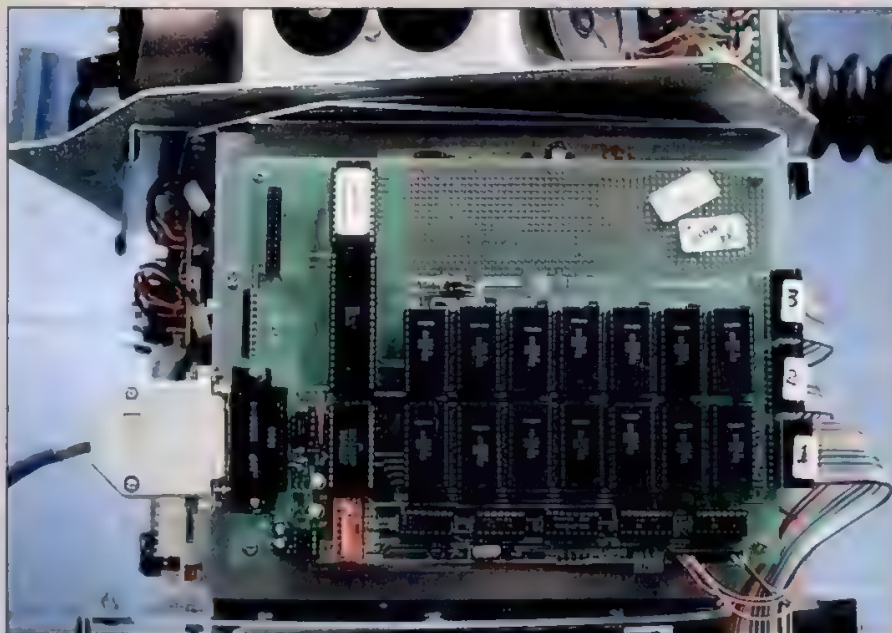
circuit cards are mounted on the outside of the walls and door; an eighth card containing the 6808 microprocessor is mounted on the inside of the wall on which the input/output card is attached. Multiwire ribbon cable and connectors connect the cards with one another. Four side covers of metal-like blue-gray rigid plastic hide all the circuit cards.

The Head Assembly

The robot's rotating head contains its single arm, wrist, and gripper assembly, a hexadecimal keypad, six 7-segment LED displays, an experimental breadboarding area for hooking external circuits to the input/output ports of the system, and a number of sensors. The sensors, which can only be seen with the head cover removed, include a pair of pulsed ultrasound or SONAR ranging transducers that lie just below the keypad (one for transmitting and one for echo reception). Just to the right of the keyboard is a transducer grouping that includes a pair of continuous wave ultrasonic motion-detection transducers (again, one to generate the outgoing signal and one to receive the echo), a light sensor sandwiched between the two motion detectors, a small loudspeaker that actually acts as a microphone is located toward the arm end of the breadboarding area, and finally, a speaker to reproduce the synthesized voice output at the other end of the breadboard. One of the two batteries needed for the logic circuits is also mounted on the head, as is the sonar receiver's printed circuit board.

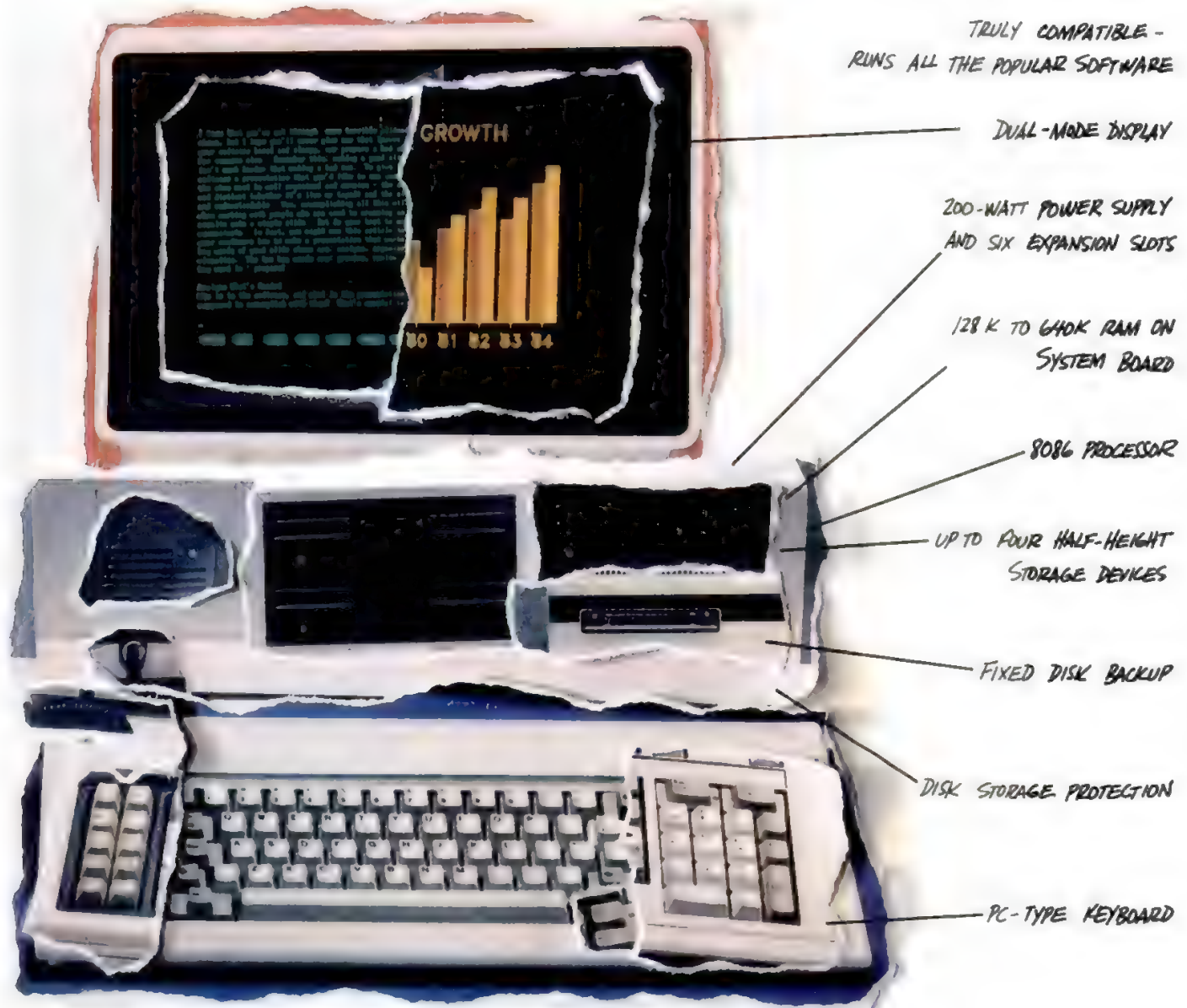
HERO's Brain

At the core of the HERO robot lies its brain, the Motorola 6808 microprocessor. This microprocessor has an 8-bit data bus and a 16-bit internal address bus that allows it to address 65,536 unique locations in memory (64K). It has two accumulators, 72 instructions, and six addressing modes (Inherent, Immediate, Direct,



Above: Micromation's HERO MemCom board. The board includes an RS-232 serial port, an on-board 2K EPROM, and 28K of additional RAM. Bolted to HERO's rear door, the board links the robot's functions to the PC, fully opening up the 64K of HERO's Motorola 6808 "brain." The board has two 8-bit bidirectional parallel ports for running peripherals. Left: HERO-1 has both a readily accessible hexadecimal keypad and an LED display for easy programming.

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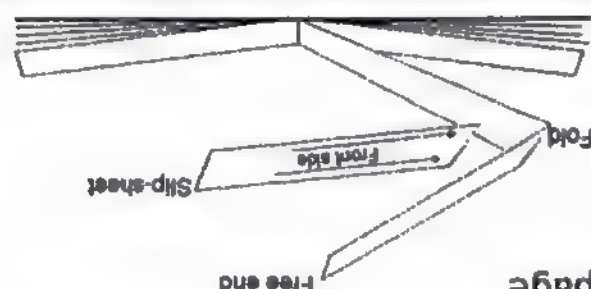
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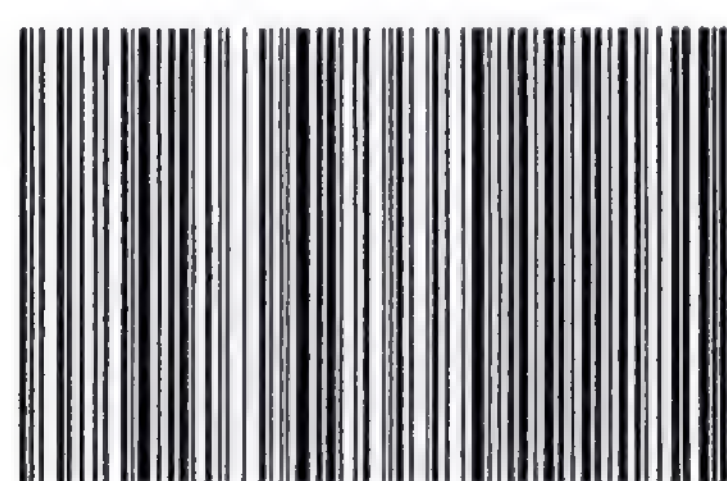
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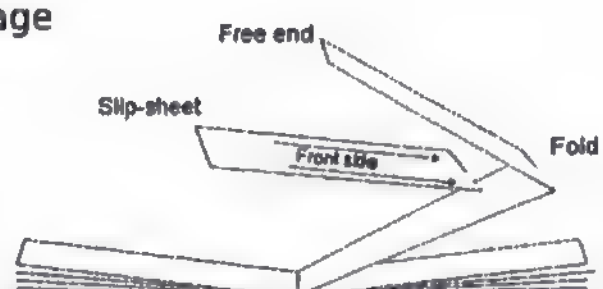


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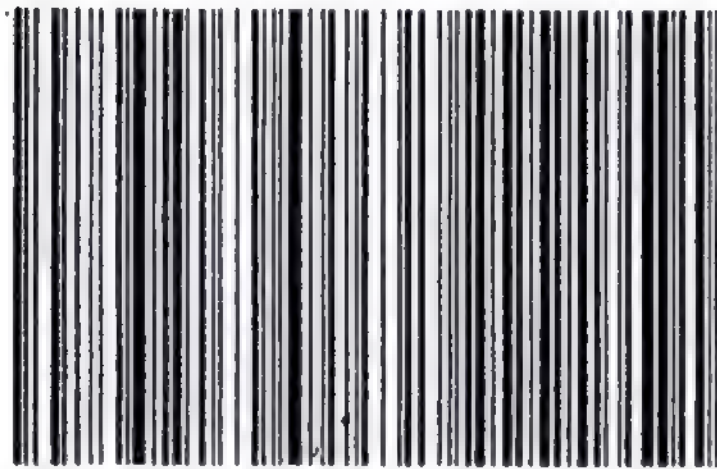
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PC CONNECTION®

HERO

Extended, Index, and Relative), for a grand total of 197 unique assembly or machine language instructions that include arithmetic, logic, branch, jump, interrupt, and stack and index register types. An 8-bit processor could have as many as 256 unique instructions, but few do. Consequently, there are 59 unimplemented opcodes (hexadecimal machine-language instructions) in the Motorola set. Supporting the 6808 is an 8K ROM and a 4K RAM system consisting of dual 2K \times 8-bit 6116 RAM chips. Of the 4K, only about 3.7K is available to the user—a serious limitation in writing long, sophisticated application programs, even in robot language. For instance, for the displays to be used as visual annunciators they must be programmed in machine language. Each routine requires a fairly large amount of memory—on the order of 50 bytes for even a simple message.

HERO's Language

Programming and activating HERO in 6808 assembly language would be tedious and time consuming were it not for the relatively simple high-level robot language that Heath has implemented in an interpreter located in the robot's on-board ROM. This 8K \times 8-bit mask-programmable ROM contains almost 7,000 machine code instructions that can be called as subroutines by the 37 robot language instructions. The robot codes have been assigned 37 of the 59 unimplemented opcode locations; this is how the interpreter can recognize them as unique.



HERO MemCom Board

Micromation, Inc.
9104 Red Branch Rd.
Columbia, MD 21045
(301) 730-1237
List Price: \$295

CIRCLE 744 ON READER SERVICE CARD

Although it is much easier to learn the robot language than to program HERO in assembly language, you can use either programming method and can even switch back and forth between the two.

use the PC to operate HERO.

Micromation's HERO MemCom (MEMory COMmunications) board may be the answer. It is a multifunction printed circuit card that bolts to the rear door of

The typewritten documentation is excellent; I installed and tested the board without a hitch in only an hour or so of careful work. But troubleshooting procedures are included should problems arise.

Sixteen robot instructions are dedicated to controlling the eight axes of motion, seven devoted to speech commands, eight to the four sensors (light, sound, ultrasonic ranging, and motion detection), two to the seven-segment LCD display operation, and four general-purpose commands. In addition, a number of machine language subroutines can be called to activate specific segments or characters in each of the six displays. This latter feature permits you to display any of the 128 segment combinations possible or to encode words or sentences (which can be flashed a word at a time). Also, a number of canned phrases and sentences can be called when appropriate.

The HERO MemCom Board

To reach its full potential, HERO needs two things: additional memory and a rapid, easy method of uploading and downloading programs and data into the robot. Since the IBM PC is well known for its proficiency in both those areas, it would be convenient if a way could be found to

HERO's torso when the plastic side covers are removed.

The board includes an RS-232 serial port with an on-board 2K supporting EPROM that allows uploading and downloading of HERO programs from a PC to HERO and 28K of additional RAM (14 2K RAM chips) which, when combined with the 3.7K HERO already has, brings the user total up to almost 32K. The board also has two 8-bit bidirectional parallel ports with handshaking lines for data transfers that can be used to drive printers or control other parallel peripherals and two 16-bit interval timers for counting and timing. For advanced interfacing projects, it has a wire-wrap prototyping area that brings out all of HERO's 6808 address, data, and control lines.

Baud rates for the board's serial port are derived from a crystal-controlled clock. You can select eight different rates using the board's DIP switches. More importantly, the MemCom serial port is configured in a Data Communications Equipment (DCE) mode that is matched to

the Data Terminal Equipment (DTE) configuration of the IBM PC's asynchronous adapter serial port. This means that the first eight sequentially numbered pins on the connectors at each end of the RS-232 cable can be connected as pin 1 to pin 1, pin 2 to pin 2, and so on without any cross-overs such as pin 2 to pin 3. (The "RS-232 serial interface standard" is sometimes not so standard.)

Installation and Documentation

The MemCom board is designed to be mounted to the rear door of HERO's torso on four standoffs that permit the board to fit nicely between the door and the plastic cover. The location is efficient because the board is electrically connected to HERO's CPU board, which is mounted to an adjacent inner sheet-metal wall of the torso. Three ribbon cables containing Molex connectors connect the MemCom board to the CPU board. Five leads at the other end of one cable must be soldered to two other HERO boards (three to the Sense board and two to the I/O board). Three Molex connectors attached to the other ends of the ribbon cables connect to the MemCom board, completing the electrical hookup. An RS-232-type DB 25 female connector resides on the board so you merely have to purchase the appropriate RS-232 cable to connect the interface to the PC. The only tools you need to install the board are a 1/8-inch drill, a soldering iron, and a small screwdriver.

The typewritten documentation supplied with the board is excellent; I installed and tested the board without a hitch in only an hour or so of careful work. The documentation has a checkoff box for each step in the installation and checkout process alongside the appropriate paragraph. Troubleshooting procedures are also included should problems arise. The instruction manual is clearly written and generously sprinkled with helpful technical information, references, drawings, tables,

EPROM source code listings, and even a program listing for an Apple II serial upload-download program.

Testing and Operation

After the board was installed and the electrical connections were made, the next step was to find out if the PC could really communicate with HERO. It could and did, but only in a relatively crude way—at least for the present.

Because HERO's 6808 microprocessor need only work with 8-bit coded data words that span the decimal numbers 000 through 255, and because this range can be represented in hexadecimal by the character pairs 00 through FF, HERO need only recognize ordered hexadecimal pairs. Since ASCII is basically a 7-bit binary code (8 bits with a parity bit) that represents 128 unique characters, it is not surprising that nonnumeric characters mean nothing to HERO. To embed a program in HERO RAM that can be interpreted as a sequence of machine code instructions (8-bit opcodes), HERO must perceive each instruction or piece of numeric data as consisting of an equivalent ordered pair of hexadecimal characters. In essence, this

To reach its potential, HERO needs two things: additional memory and an easy method of uploading and downloading data.

means that the first 4 most significant bits of an ASCII code word can be lopped off and only the least significant 4 bits need be recognized as a hexadecimal number.

The Micromation, Inc., EPROM software is constrained to decode or encode the least significant nibble of an 8-bit ASCII character as a hexadecimal number, which it reads from or writes into a starting location in the 32K bank of HERO memory. Since the least significant 4-bit nibble of the ASCII code for the decimal numbers 0 through 15 (0 through F in hexadecimal) is also the straight binary code for these numbers, the most significant 4-bit nibble of the ASCII code (0011) can be removed and two hexadecimal numbers can be efficiently packed into a single 8-bit byte. This is essentially what is done in storing opcodes, pseudo-opcodes, or data in the MemCom format. In short, it means that a PC will need some sort of software package to both encode and decode information going to and from HERO in order to make programming the robot relatively easy and efficient. Micromation, Inc., has supplied such a program for the Apple II, but, as far as I know, one does not exist for the IBM PC.

The Micromation HERO MemCom board is a versatile piece of interfacing hardware that offers a much-needed stepping stone toward an efficient link between the IBM PC and the Heath HERO-1 robot. It opens up a direct bidirectional communication channel between the PC and the HERO robot and gives you an almost a tenfold increase in available RAM so that HERO can execute large programs that can potentially be saved to disk for later use. Still needed is a good PC software package that will complete the PC-to-HERO connection. ■

John Goodlet is an associate professor in the Department of Technology, School of Engineering, at the City College of New York.

A PC MIX^{for} MUSIC BIZ^{the}

Submitted for your consideration: Ariel and MetroGnome, two new companies whose products may transform the music business and the music it makes.

If you're inventive enough, you can find a hundred uses for a tool other than the one it was designed for. A good hammer also makes an excellent paperweight, a so-so ruler, and an interesting (if slightly dangerous) juggling prop. But it's best at being a hammer; that's its most practical application.

Computers are a little different. While they're best at being com-





Illustration: Blair Dawson

puters, you'd be hard pressed to name a single "best" application—or even a dozen. People see computers doing flashy things, and then they define the tool in terms of what it's doing without thinking any further. This happened in the music business with . . . well, with music.

The music field is positively abuzz with computerized instruments and recording consoles and digital recording decks. But the business of music—from technical support and maintenance to making sure the royalty checks go out on time—is still something of a wasteland when it comes to computers. Sure, CBS Records has mainframes to handle its cash flow and contracts. But there are well over 4,000 recording studios in the country, 10,000 music publishing companies, 100,000 gigging musicians, and at least a quarter of a million people writing songs. The power of the personal computer hasn't done all that much for the folks behind those numbers—until recently.

Now new hardware and software are beginning to fill needs the music business barely knew it had. These products will have their cumulative impact on the practical side of the recording industry, the environment in which all popular music is first midwived and then marketed.

Two such products are the RTA 331 Spectrum Analyzer from Ariel Corporation, and a series of five industry-tailored databases from MetroGnome. Let's take a look at these two ground-breaking companies and their offerings.

PC ANALYZER

Ariel RTA 331 Spectrum Analyzer

Ariel Corporation
600 W. 116th St.
New York, NY 10027
(212) 662-7324

List Price: \$649.95 (includes hardware, software, manual, source code, and support)

Requires: Color/graphics adapter, expansion slot.

CIRCLE 797 ON READER SERVICE CARD

ARIEL'S SPECTRUM ANALYZER

Simply defined, sound is nothing more than waves of changing air pressure. The amount of pressure change in a soundwave determines its *volume*, and the rate of pressure change over a given time (known as wavelength) creates its *pitch*.

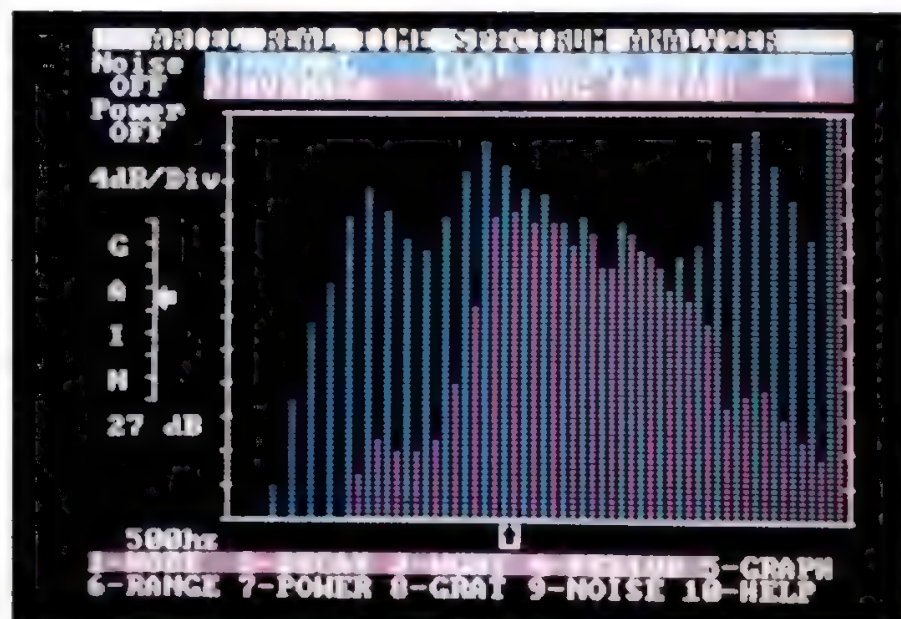
These two aspects, volume and pitch, are the things about sound that most of us are aware of on a conscious level. But there is more to sound than meets the conscious ear. Even a relatively simple synthesizer beep's tone color and pitch result from a continually changing complex of waveforms called *harmonics*. In order to "hear" these less-obvious elements of sound and to make deliberate use of that information, we have to apply a special tool called a "frequency spectrum analyzer" such as the RTA 331 from Ariel Corporation.

"RTA" stands for "real-time analysis," and what it means is that you can take your IBM PC, plug in the 331 peripheral card (with a cable-attached

box of electronic filters), run the RTA program, and completely analyze the frequency range and intensity of any sound source.

Spectrum analyzers, even real-time ones, have been around for many years, but they've been hardwired, inflexible, and expensive (like many such tools were before the days of microprocessors). The Ariel company has taken advantage of the PC by connecting hardware to it that instantly breaks down incoming sound signals into raw data and then uses the PC's processor and software to analyze and display that data in a variety of useful ways. Since the form the analysis takes is software driven, it isn't limited. You can customize it to suit your needs or even to develop entirely new applications.

Here's what you see in its most basic form. On the PC's medium-resolution screen (320 × 200 pixels) you'll find a 64-bar graph display in two colors. Each color represents a different kind of anal-



The RTA 331 from Ariel Corporation generated this frequency spectrum analysis of a synthesized rhythm section.

ysis, and both are done simultaneously. You can choose from several kinds of analysis—the telltales for your choices are the color-matched bars across the top of the screen. To the left are readouts that tell you whether or not the 331's on-board pink noise source (which provides a calibration standard for analyzing a given area's audio response) is on, what the decibel (dB) scale setting for the graph is, and what your input volume is set to. At the bottom of the screen are the system's different primary commands and the function key numbers you use to execute them.

You also see movement. Lots of movement. Imagine, for a moment, that you've plugged your radio into the standard 1/4-inch phone input jack in the 331 peripheral card. On the screen all 64 bars will be snapping up and down, in perfect time to the music, each bar representing the amount of sonic energy in that particular portion of the sonic spectrum, which the RTA 331's filters will measure all the way from very low notes (20 cycles per second) to the upper limits of healthy human hearing (around 20,000 cycles per second, although most adults can't hear much above 16,000).

Putting It to Use

All well and good. It's a great light show, and it beats a cheap sixties color organ for visual appeal. But how can you use it?

Those in the music business will find plenty of ways. At every step of the recording, record-pressing, radio-broadcasting process, sound has to be compromised and optimized to make up for limitations in electronic hardware and the laws of physics. More often than not, because of the prohibitive cost of good analyzing gear, these choices are being made by guesswork and engineering intuition. The RTA 331 presents a lower-cost way of providing vital information and throwing the guesswork out the window.

Take the simple case of a recording session where the engineer has to blend the



These products will have their cumulative impact on the recording industry, the environment in which all popular music is first midwived and then marketed.

bass guitar and the bass drum sound successfully. This is quite a challenge, because (a) they occupy much the same frequency range; (b) to fit sounds onto a record they have to be compressed, reducing timbral characteristics that keep the two sounds distinct; and (c) low notes are more omnidirectional, conveying less spatial information than midrange and higher frequencies, so that the two instruments will tend to sound like they are coming from the same place when reproduced.

The solution is to adjust the frequencies of the two recorded sounds, a trick called *equalization*, so that they "peacefully coexist." Depending on what else is happening in the music at the same time, this can be as simple as notching out a selected portion of the drum sound (creating a pocket for the bass guitar to "sit" in), or as complex as performing radical sonic surgery on both sounds. Done by ear, this can take hours of trial and error, but a quick pass through the RTA 331, with which you can actually get a picture of

what's happening with the sounds, both isolated and mixed together, could identify the appropriate approach in minutes.

That's a simple example. The RTA 331 has many practical features that widen the range of its possible applications even further. It can be set to give you an averaged response, over selected times, so that you can scan a sound for its most frequently recurring strong points.

The color bars can be set to hold at peak points or fall away from them gradually, which gives you time to think about the data you're getting. This is particularly useful when setting one 31-bar graph in color A in this mode and its side-by-side 31-bar graph in color B in the standard instant-rise-and-fall mode, giving you both forms of analysis at the same time. The screen's readout can be toggled to freeze at any time. Selected "weighting curves" for the analysis can be chosen, or even user-defined, so that patterns conforming to certain long-term industry standards for frequency analysis can be

obtained. And the frequency indicator arrow can be set, in software, to automatically flash beneath the band of the spectrum with the greatest amount of energy from moment to moment.

Sound Applications

Even if this were all the RTA 331 could do, it would be immensely valuable in all of the following applications:

- augmenting the more specific (but also more limited) readouts of an oscilloscope in audio design and testing;
- sound recognition (in its crudest form, analysis for the fun of it. You could also put one of the home-controller systems on the market in another PC slot and

write software to trigger it by patterns that the RTA 331 would detect and respond to. You could set your PC to respond to your voice and to no one else's.);

- preventing distortion while recording, mastering, and record-plating by keeping track of peak-level transients;
- room analysis and studio design for better recording, using a pink noise source and a mobile microphone input to figure out a given recording studio's sonic weak points so that they can be fixed by reconstruction or appropriate electronic equalization;
- multichannel level indicators and sound analysis (as in the bass guitar/bass drum example, but on a wider scale);

- measuring reverb characteristics;
- audio component design/testing;
- many acoustical laboratory techniques.

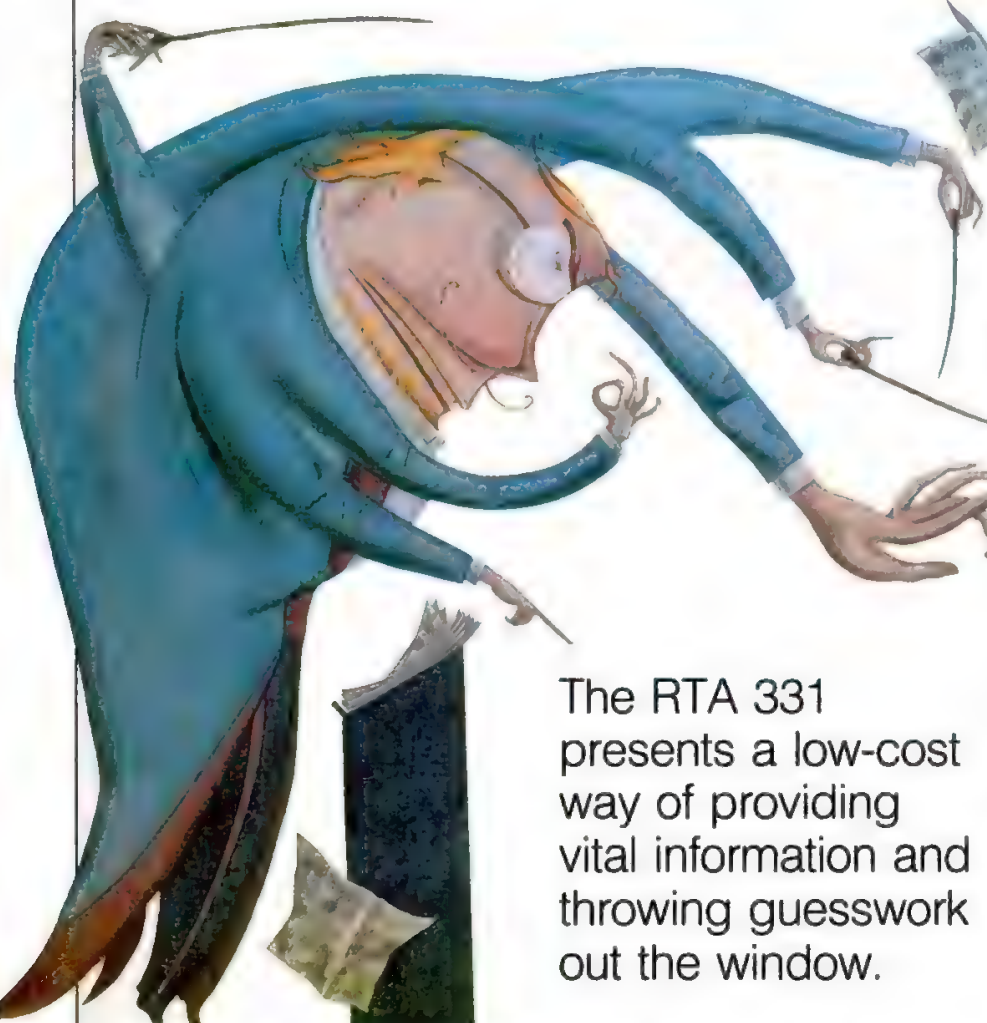
Data In, Data Out

All of the above would be plenty, but there's still more, thanks to the RTA 331's second primary program. It's called DIO, for "Data In/Out," and it allows you to turn your PC into a digital sound recorder. The actual amount of sound that can be "sampled" (as this kind of digital recording is referred to) and played back is directly dependent on how much memory you've got and what kind of playback frequency bandwidth you require. With 512K of memory, you can manage about 20 seconds of audio storage at the standard sampling rate, but it would be possible to get longer samples if you were willing to lower your sampling rate and fidelity. (If you want to figure out how many seconds of sound you could get with a given amount of memory, subtract 64 from the number of installed kilobytes and divide that figure by 20.)

DIO allows you to really dig into the waveform of a given sound or mass of sounds over time and to plot one or more sections or to compare old and new sounds on the screen simultaneously, in your choice of four colors. And since the sound is now a data file, it can be manipulated in programs to play back in any way imaginable—backwards, cut up and rearranged, or looped.

As it stands, DIO is a tool seeking a set of possible applications; it's a capability that the RTA 331 supplies but does not elaborate on.

Ariel is a small company, and it prefers to concentrate its development efforts on putting tools into people's hands, instead of delimiting the uses of those tools in advance. To that end, Ariel supplies a comprehensive manual with the RTA 331's complete assembler source code listings and invites the creativity of individual engineers and programmers, wherever they may be.



The RTA 331 presents a low-cost way of providing vital information and throwing guesswork out the window.

METROGNOME DATABASE SOFTWARE

Take Mark Augelli, a former IBM systems engineer with business interests in the Nashville studio and music publishing scene. Introduce him to Larry Keith, a songwriter and music publisher with a growing interest in computers. Stir in a mutual inspiration—that the music field was largely untouched by the wonders of computer organization and was thus an open market—and presto, you have a tidy little company called MetroGnome, dedicated to giving the industry what it needs and wants—to take care of business.

"The first package we did," says Augelli, "was *Catalog Plus*. It was designed to help music publishers, not only by keeping track of their royalties, but by seeing the business for what it is—the marketing of a product. Nobody had ever written anything that said, 'This is how you market the songs.'"



Music Business Databases

MetroGnome, Inc.

602 W. Iris Dr.

Nashville, TN 37204

(615) 298-4948

List Price: *Catalog Plus* (comes with *Advanced DB Master*) Catalog Management System, \$1,195. Staff Management, Contact Management, and Income Management modules, \$100 each. *Sessions Plus* (comes with *Advanced DB Master*), \$1,195. *Pickers Plus*, *Writers Plus*, and *Labels Plus*, \$149 each.

Requires: *Catalog Plus* and *Sessions Plus*; 256K RAM, one disk drive (two disk drives or hard disk recommended). *Pickers Plus* and *Writers Plus*: 64K RAM, two disk drives. *Labels Plus*: 64K RAM, one disk drive.

CIRCLE 798 ON READER SERVICE CARD

This screen is from the song casting module of *Catalog Plus*, which is a template for the *Advanced DB Master* database program.

Accordingly, the database modules in *Catalog Plus* are organized to cover four sections—catalog management, staff management, income management, and contact management—in such a way that good business tends to be done automatically. For example, under Catalog Management, there are sections for master song data, song casting (that is, who you think is a good prospect to perform a number), song release, foreign catalog data, and even song pitch (not the key of the tune, but whom you've tried to sell it to, whom they represented, their reactions, and so forth).

Two of the five MetroGnome packages—*Catalog Plus* and *Sessions Plus*—are actually templates for StoneWare's *Advanced DB Master*, a database program that's included in the packages' cost. (For a review of *Advanced DB Master*, see "Project: Database, Part 3," PC, Volume 3 Number 13.)

Says Augelli of the choice, "We looked at the feasibility of doing it our-

selves versus using another database system, and we came to the conclusion that we couldn't come up with that much better a product in the long run. All we'd end up doing would be to triple development costs and therefore have to triple our sales price. One of my corporate jobs prior to MetroGnome was overseeing software package reviews for micros, so I'd had an opportunity to examine just about every database that had come down the line. I just don't feel that there's anything comparable to *DB Master* in terms of search and retrieval, which are the most important aspects of our systems. Also, *DB Master* allows us to handle multivolume files. In the Session Log section of *Sessions Plus*, for example, you end up being able to store about 350 records on a disk. But if you want more in the file than that, you just tag a second disk as Volume 2, and the program will guide you back and forth between them as needed."

MetroGnome also likes *Advanced DB*

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CIRCLE 295 ON READER SERVICE CARD

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▼ TOOLS All Source Code is included

Total string capability, complete screen access, keyboard handling, a graphics interface, access to all BIOS functions, and much more are provided in over 40 routines.

▼ TOOLS 2 All Source Code is included

A general DOS gate allows you to access any DOS 2.0 function from Pascal or C. Program execution and DOS internal command execution are supported as high level calls.

▼ VIEW MANAGER Source Code available

VIEW MANAGER is a screen support system of a mainframe for the IBM PC/XT. Screens are constructed with a true Screen Painter supporting any attribute or color and the screens are stored efficiently in a Screen Database. VIEW/LIBRARY supports access to screens and true block mode data capture and display from application programs.

TOOLS	125 00
TOOLS 2	100 00
VIEW MANAGER	275 00
VIEW MANAGER (with Library Source)	425 00
MS-Pascal Compiler	275 00
Microsoft C Compiler	450 00

BLAISE COMPUTING INC.

2034 Blake St. Berkeley, CA 94704 415/540-5441

CIRCLE 150 ON READER SERVICE CARD

PC MIX

Master because it allows the company to offer its customers the actual database, not just a run-time module as with *dBASE II*. When you buy a top-of-the-line MetroGnome product, you are buying the database itself, which means you can develop your own database applications if you wish. It isn't likely, though, that you'll be doing anything musical with it. Given the limits of a nonrelational database, MetroGnome has pretty much covered the bases.

Catalog Plus also covers staff and writers, credits, awards, royalty income, royalty payments, song expenses, expense account listings, contacts lists for record executives, producers, promoters, and publicity contacts.

Sessions Plus is a business management database for the small or large recording studio, with provisions for session and rental logs, maintenance records, equipment and tape library inventories, and directories of talent, rental gear, clients, and suppliers.

Pickers Plus, a name that is proof positive of MetroGnome's Nashville origin, serves the session or semiprofessional musician, with listings for session schedule, session log, band schedule, band income, expenses, credits, personal inventory, and an action list.

Writers Plus is a songwriter's home business package, covering royalty income, expenses, awards, an action list, song demos, song releases, classifications, and an overall song register. MetroGnome even included a built-in word processor that's just big enough to handle lyric sheets.

Labels Plus generates cassette and reel-to-reel tape labels and inserts. If you have a song in your catalog, all the data for it can be ready to print up when you want to provide information to go with your tapes. This program is aimed primarily at the small studio. It's all automatic, can print hundreds of copies, and will prevent a lot of writer's cramp.

Printouts, in all of these packages, are currently preselected summary sheets.

That will change in the next release, which will have more extensive formatting and will allow the user to choose the information to be printed out. (Source code listings are available to those who want to customize before the second release is available.)

Sales, so far, have been good—but there's plenty of room for growth.

"People are cautious, as well they

Catalog Plus
covers staff
and songwriters,
royalty income,
royalty payments,
and much more.



should be," observes Augelli. "Particularly in the music business where new things come along every 5 minutes. But we just placed a system with Word Music, the largest gospel publishers in the world, with offices in Los Angeles, Indiana, and Nashville, and . . . they're ecstatic. It's very pleasing."

"In fact, we get a lot of people calling us up not just to ask about our software but to ask about computers in general. What kind to buy. What software to use with it. We seem to be on our way to being a kind of voice for the whole concept of the computer in this industry, and that's very satisfying."

Time for a Change

MetroGnome's database packages, like Ariel Corporation's RTA 331 Spectrum Analyzer, are so cost-effective that they may cause major changes in the way the music business *does* its business—which down the line may bring about major changes in the music itself. You don't move one without also moving the other.

I like that. If our music is blossoming, then so are we. ■

Micro Flash is Reliable

- In our 4th year of business (*One of the Originals!*)
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- All returns must have a Return Authorization Number
- \$100.00 minimum order
- Products and prices subject to change without notice

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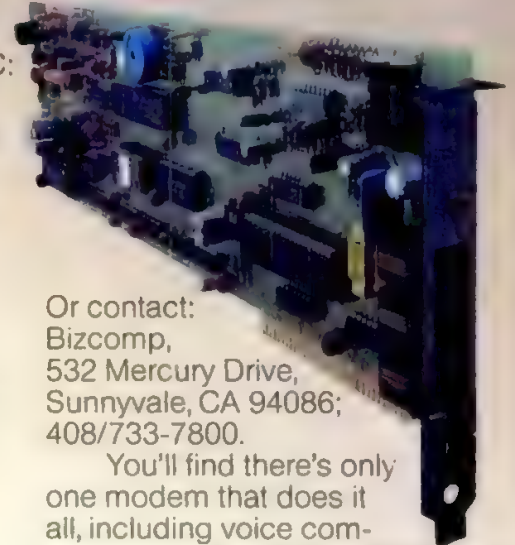
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532 Mercury Drive,
Sunnyvale, CA 94086;
408/733-7800.

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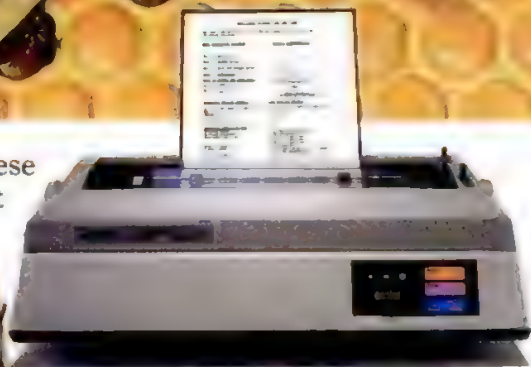
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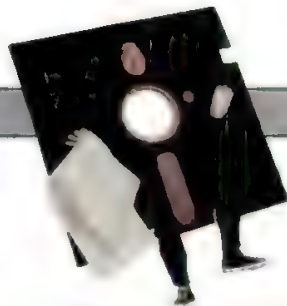
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PROJECT: DATA BASE Part 6

PC heads for the homestretch of its seven-part database derby with an impartial look at the crowd favorite, dBASE II, and analyses of other Category 3 offerings.

In this penultimate installment of Project:Database, we complete our coverage of databases with procedural or programming capabilities. It's about time, therefore, that we reviewed *dBASE II*, the progenitor of the personal computer database explosion.

We knew as we planned Project:Database that Ashton-Tate's bestseller had become the industry standard—and many users' first love. Precisely for that reason,

we wanted to be sure we didn't accord it special treatment in the evaluation process. When selecting a reviewer, we decided he or she could *like dBASE II*, but anyone with professed *adoration* for the package was passed over.

Even though all of our authors have been admonished to bury preconceived notions, the reviewers of this group have found admirable qualities in all the databases. The reviewer of *Condor 3* felt it

was such a fine example of a classic relational database that he is using it in teaching a college database course. *MAG/base III* is tailored for users with existing BASIC programs and files. *RL-1 DATA BASE* and *OPTIMUM* stand out as applications development tools, while *Day One* is completely menu driven.

This issue should please many database users, even those who are still true to *dBASE II*. —Stephanie Stallings

Condor 3: Mellow and Marvelous



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Kositchek	151820	Shipping	29200.00
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Bittner	137820	Shipping	29200.00

Condor 3 lists display salary data by combining the data with a form in response to a LIST command specifying field names.

Condor 3 is a textbook example of what a relational database management system should be. The program has most of the features of *dBASE II*, but it makes using those features much easier. The two excellent manuals are clear and filled with examples. A cursory reading combined with my intuition allowed me to do useful work with *Condor*.

Defining a new database (called a dataset in *Condor*) begins with the creation of a data entry form. At *Condor's* A>> prompt, type the command DEFINE. The user interface is a command set, but certain commands invoke menus that appear at the bottom of the screen.

To design a form, you arrange fields on a screen that is blank except for a small menu. Each field name is placed within brackets, followed by underlines indicating the length of the field. You can also include comments and instructions for data entry operators on the form. After

you are satisfied with a form, you define the field types, a process through which *Condor* prompts you. The available data types are alphabetic, alphanumeric, numeric (integer), numeric with decimal places, dollar, and Julian (date). *Condor* then displays each field name, field type, field length, minimum length, any default values, and, if applicable, a notice that the field is required. Unlike many other database managers, *Condor* lets you change a file's format and redefine the structure at any time, using the FORMAT command.

When you finish defining a file, the program asks you if you want to index it. Although this is the obvious time to index, which you must do in order to perform certain kinds of searches later, if you want to index a file at some other point, the INDEX command conveniently allows you to do so.

Data entry is straightforward and easy. *Condor* automatically displays default values for fields, and it provides an Auto-Repeat option that re-enters values from a previous record. Data from outside files can also be read into a form if the record structures of the files match. I had no problem importing the *PC Magazine* test files. *Condor* can write files in five different ASCII formats, so you can easily export its files to other programs.

Condor's query language is the primary way to perform retrievals of all types:

one-time reports, ad hoc requests for information, browsing, and sorts. The query language is a rich one with a classic relational terminology. For example, to retrieve names and employee numbers from a file of employees, you would enter: LIST PERSON BY EMP.NUMBER, LAST.NAME, FIRST.NAME. To print the output, substitute PRINT for LIST. To create a temporary file use PROJECT instead of LIST. PROJECT is especially useful; you can use it to create a new database with the attendant file definition and form. You can save a temporary file by typing SAVE followed by a new filename. The query language also makes it easy to merge and sort files by specific fields in order to obtain just the information you need. *Condor's* sorting time is average for a program of its type.

Procedural Language

Condor also lets you construct a permanent command file with which to batch-execute commands. This feature, called the procedural data manipulation language, provides you with seven extra commands in addition to the query language: IF, ENDIF, GET, LET, MESSAGE, END, and ABORT. Noticeably absent from the list is a DO command; the available command set does not include a way to loop or control a loop. Still, the existing commands can handle many updating processes.

Say, for example, you had two files with current information on employees.

Condor 3

Condor Computer Corp.
2051 S. State St.
Ann Arbor, MI 48104
(313) 769-3988

List Price: \$650

Description: Relational

Requires: 64K RAM, two disk drives,
PC-DOS 1.1.

Records per File: 32,767

CIRCLE 799 ON READER SERVICE CARD

These files would be periodically updated in a batch-processing mode using an UPDATE.CMD file. The update process creates new, up-to-date files that can be checked and then substituted for the obsolete files. The updating process captures the changes in a RESULT file, to which you can add the date with the COMPUTE command.

To maintain historical information about changes to the files, you can keep a HISTORY file that will contain all the RESULTS files created when you update database files. The HISTORY file becomes an archive containing the records of changes over time.

Report Generation

Condor's REPORT command is a full-blown report writer that I couldn't learn to love. Producing a report involves five steps: You must first plan to format the report on paper, then format the screen to match it. You specify or define each item on the screen, revise if necessary, and, finally, print out the report. The process sounds tedious and it is, but in normal business use you would save a report format and reuse it every time you updated the records. For one-time use, however, formatting a report with REPORT is more trouble than it's worth.

Fortunately, you can get around REPORT by relying on the query language commands PRINT BY and TITLE. With PRINT BY you can select the fields you want to see; with TITLE not only can you print a title line, but you can also define line width, page length, and spacing. The combination lets you turn out great reports very easily.

Condor has been around for about 7 years, a long time in this industry. It runs on many machines, and it's standard equipment on several, such as the Hewlett-Packard 150. By now the bugs have all been worked out, and the program is a joy to use. I felt comfortable with Condor right from the start, and I've become more and more fond of it with practice.

—James Perotti

dBase II: The Standard Bearer

```

USE G3PERSON

LIST STRUCTURE
STRUCTURE FOR FILE: E:G3PERSON.DBF
NUMBER OF RECORDS: 00500
DATE OF LAST UPDATE: 05/31/84
PRIMARY USE DATABASE

```

FLD	NAME	TYPE	WIDTH	DEC
001	FIRST	C	011	
002	LAST	C	015	
003	EENO	C	006	
004	ADD	C	030	
005	CITY	C	020	
006	STATE	C	002	
007	ZIP	C	005	
** TOTAL **			00090	

The structure of the employee record in dBASE II.

Ashton-Tate's dBASE II is the Klee-nex of database systems—the product that everyone thinks of when the word *database* is mentioned and the standard by which they judge all other databases. A subindustry has grown up around this software. Some firms provide training courses for dBASE II; others specialize in producing run-time applications software based in dBASE II. Authors have made their fortunes writing books to explain the program's uses and techniques. Companies exist to produce software for the sole purpose of helping dBASE II programmers in the development of new applications. Still other firms develop programs that either interface directly with dBASE II or with the program's files to provide graphics, statistical analysis functions, and the like. The list of third-party suppliers of dBASE II add-ons grows every month.

dBASE II, Version 2.4

Ashton-Tate
10150 W. Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570

List Price: \$495

Description: Relational

Requires: 128K RAM, two disk drives, DOS 1.1.

Records per File: 65,535

CIRCLE 757 ON READER SERVICE CARD



(For a comprehensive review of some of these products, see PC, Volume 3 Number 2 and June 1984 PC Tech Journal.)

While the program does have limitations, especially when compared with mainframe systems or software that has been derived from mainframe systems, the limitations are based primarily on capacities (maximum number of characters per record, maximum fields per record, number of open files at one time, and so forth) rather than on functionality. All of the functions expected of database management system are in dBASE II, as well as a few unexpected ones. dBASE II's range of database functions makes it a useful tool for a wide range of tasks, from simple name and address files to complex appli-


```

REPORT
ENTER REPORT FORM NAME: CITYLST
ENTER OPTIONS. M=LEFT MARGIN. L=LINES/PAGE. W=PAGE WIDTH W=80
PAGE HEADING? (Y/N) Y
ENTER PAGE HEADING: CITY LISTING
DOUBLE SPACE REPORT? (Y/N) N
ARE TOTALS REQUIRED? (Y/N) N
COL      WIDTH CONTENTS
001      27 TRIM(FIRST) + " " + LAST
ENTER HEADING: NAME
002      20 CITY
ENTER HEADING: CITY

```

A portion of a *dBASE II* interaction for creating a report. Fields for each record are printed horizontally by the report generator, and any line greater than the specified width will wrap.

cations such as a full accounting system. But there's a catch. With low-end, menu-driven systems designed solely for simple file management, you sacrifice speed and power for simplicity of use. In a command-driven system like *dBASE II*, on the other hand, the reverse is true—ease of use is sacrificed for the advantages of speed, versatility, and computing power.

As a simple file-management system, *dBASE II* offers little of the ease of use common to the menu-driven programs reviewed in earlier installments of "Project: Database." *dBASE II* requires that you know which of the many commands available in the system to use at any particular point in a session. Help screens are available, especially in the current Version 2.4. Still, long hours of learning *dBASE II* syntax, as well as the commands themselves, are a normal prerequisite to making the most of this type of software.

Even with this apparent lack of congeniality, *dBASE II* can be effectively used by novices to create and maintain a database file. Several of the commands (most notably CREATE and REPORT) engage you with a dialogue of easily answered screen prompts for data. If you wish to define a file and issue the CREATE command, you will be presented with a series of questions concerning the name of the file and information about each field's

name, length, and type (character, numeric, or logical). If you add or change a record using the APPEND or EDIT command, the program will bring a default mask onto the screen for you to fill in or alter. The default data entry screen is useful and clearly defined, making use of inverse video or color to define the areas to be filled in at the keyboard. In response to incorrect command entries, the software responds with yet another question, CORRECT AND RETRY (Y/N)? that helps cut down keystrokes.

In short, you can get *dBASE II* to easily perform required tasks if you've learned basic database-management functions and if you're willing to take the time to look up the appropriate commands as needed until familiarity makes them second nature.

Do-It-Yourself Menus

Where *dBASE II* truly excels is at the high end of database system use, the creation of complex multiple-file databases and applications. As you gain familiarity with the program, the range of its possible uses also grows. It's nearly impossible to outgrow *dBASE II*—something that cannot be said of simpler file-management systems. *dBASE II*'s command language capability (see "Micro-Linguistics: Languages for the PC," *PC*, Volume 2 Number 4) offers a flexible tool that can, with one command (MODIFY COMMAND,

oddly enough), turn the experienced *dBASE II* user into a programmer capable of producing miracles. When you get to a point where you can use *dBASE II* as a program development tool, those long hours spent learning its syntax pay off.

The command language enables you to utilize the power of the command structure to set up batches of commands and store them in a *dBASE II* command file named, for instance, MYPROG.PRG. The commands may be executed merely by keying DO MYPROG. Through the use of this procedure, the user may develop highly complex programs utilizing DO WHILE loops, IF-ELSE-ENDIF statements, and a full range of logical operators. You can take this one step further by setting up a DOS batch file that will automatically start *dBASE II* and execute the command file.

dBASE II's built-in language offers a bonus that many of the more familiar languages, such as Pascal and C, don't: interactive debugging. SET STEP ON and SET ECHO ON can walk even the most timid programmer line-by-line through a command file, pointing out where things go wrong.

These features make *dBASE II*, and its recently released cousin, *dBASE III* (which will be reviewed in the next issue of *PC*), something truly special: software you can't grow out of. The more you use *dBASE II*, the wider the range of applications you can tackle with it. It's an infinite loop.

Reports Made Simple

To produce a report of file data, you first open the file with the USE command, verify the names and widths of the fields to be included in the report (with either DISPLAY or LIST STRUCTURE), and then enter the single word REPORT. *dBASE II* responds with a series of prompts for data defining the report. After defining the last column, you end the dialogue by hitting the Enter key.

The report format thus created is automatically stored on disk (with a .FRM

extension added by *dBASE II*), and the report itself scrolls on screen.

To produce a report listing only selected records from the file—selecting records where the state field equals NJ, for example—the command becomes: REPORT FORM (filename) FOR STATE = "NJ". To make a hard copy of the report, the words TO PRINT are added to this command line.

For more advanced users, *dBASE II* offers the capability to create format files (extension .FMT). These files, similar in approach to the command files, allow you to custom-design data entry screens and reports, placing data fields exactly where desired and permitting the use of pre-printed business forms such as invoices. With format files prepared for them, less-experienced users can use the system for specific applications. Input screens can be designed to present the person entering data with a formatted screen as simple as anything presented in a "rolodex-style" database program. Additionally, error checking, more extensive than anything found in those systems, can be "programmed" by the designer of the application. Some applications—updating a customer master file based on a daily transaction file, for example—may require processing more than one file at a time. *dBASE II* provides for multifile processing and, although only two files may be active at once (*dBASE III* increases the maximum to ten), the ability to generate instructions allows you to process many more than two files at one time—you simply activate files when needed and allow them to be deactivated when others are needed.

For those who aspire to database proficiency, we heartily recommend *dBASE II*. It has enough power to perform basic database management functions well; it has a proven track record and a wide user base, and a wealth of supplemental software, literature, and training material exists to take the sweat out of those hours of learning and labor.—Barbara E. McMullen and John F. McMullen

Mag/base III: A Good Choice for BASIC Users

FILE DEFINITION	File: <file description>	MAG / base
CHANGE		06/01/83
=====		
Define field number (<#>):		
1. Field ID		<xxxxxxxx>
2. Field Description		<xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx>
3. Field Type (A,N,&,D,Y,I,R)		<X>
4. Minimum Field Length		<##>
5. Maximum Field Length		<##>
6. Decimal Place		<##>
7. Minimum Value		<=====>
8. Maximum Value		<=====>
Enter desired change number, RETURN=Page, or 'END': ____		

In *MAG/base III*, fields are defined and altered with a File Definition menu.

Can a classic file management system written in BASIC find a place in today's market when it's priced at \$795? That question passed through my mind as I began reviewing *MAG/base III*, a product of MAG Software, Inc. *MAG/base III* is the most sophisticated version of a program that comes in two other, less-expensive forms. *MAG/base I*, at \$295, has most of the basic features of *MAG/base II* and *MAG/base III*, which MAG

calls its application development system. Each version is fully compatible with the less-powerful ones and includes all their

MAG/base III

MAG Software, Inc.
21054 Sherman Way #305
Canoga Park, CA 91303
(213) 883-3267

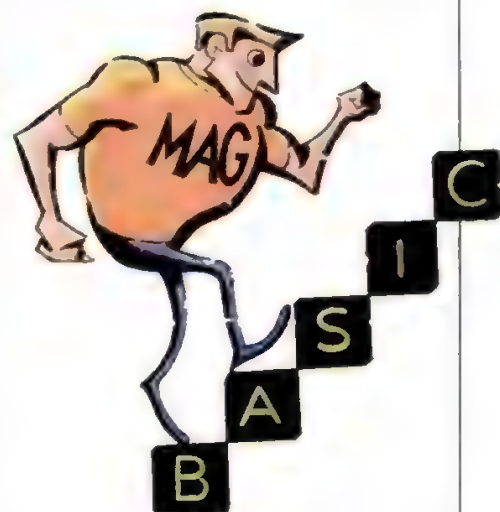
List Price: \$795

Description: Relational

Requires: 128K RAM, two disk drives,
DOS 1.1.

Records per File: 32,000

CIRCLE 756 ON READER SERVICE CARD



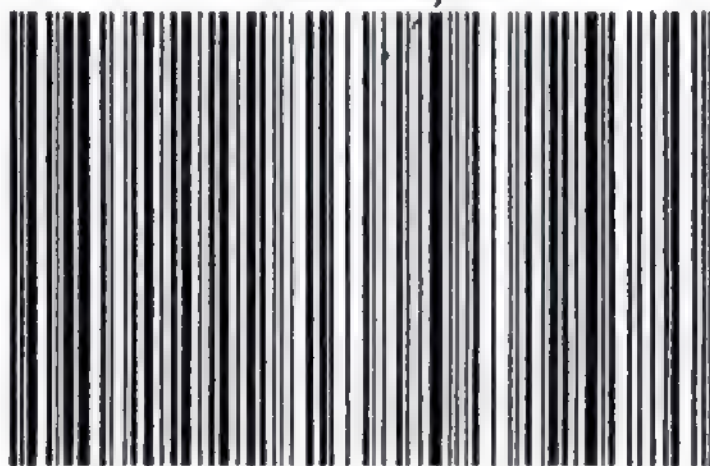
Input Screen Specifications

Method	Capabilities				
	No. screens per file	No. files per screen	Simulate paper forms	Link help messages/ prompts to a field	Master/detail relationship
"Painted"	1	Unlimited	Yes	Yes	Yes
Automatic (fixed) but "painted"/programmed screens may be generated through use of the command language.	Unlimited	2	Yes	Yes	Yes, programmable.
Prompted	1	1, though more available with programming.	Yes, but limited to simple 2-column forms.	Yes	Yes, programmable.
Choice of 3: automatic (fixed); programmed (using high-level interfaces to Pascal, Assembly, FORTRAN or BASIC); or menu driven via Relational Editor.	Unlimited	1 with fixed screen; unlimited with high-level programming.	Yes, using high-level language interface.	No	Yes
Automatic, "painted," and programmed.	50	Unlimited	Yes	Yes	Yes
Prompted	Unlimited	9	Yes	Yes	Yes

1. Follow instructions on the other side

Back

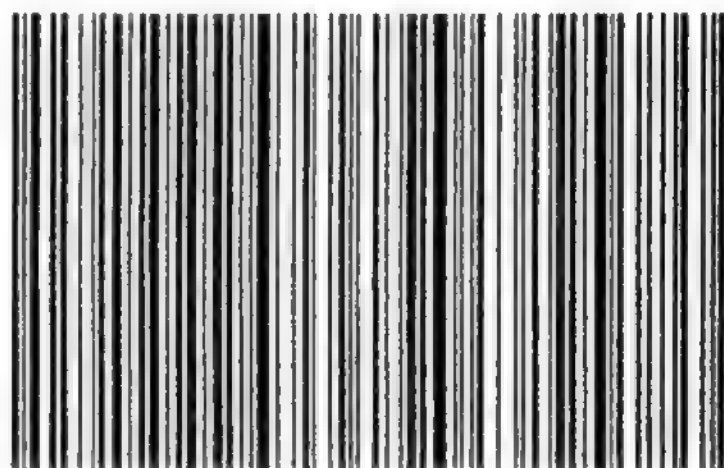
Gbs5lipBack-0018



Inverted Back

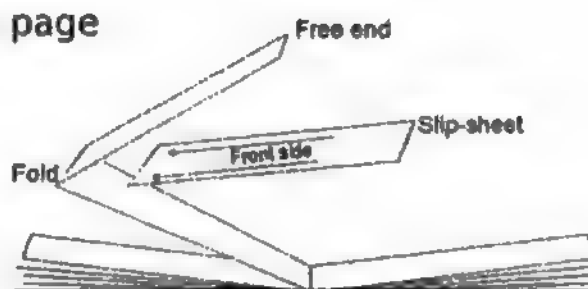
1. Follow instructions on the other side

Folded edge of the page



Inverted Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
 1. Front side touching the free page
 2. Arrow pointing to the fold
3. Slice the folded edge
4. Close the page and slip-sheet

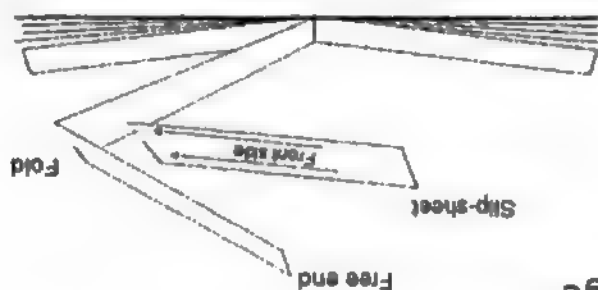


1. Open the foldout page
2. Insert this sheet with

1. Front side touching the free page
2. Arrow pointing to the fold

3. Slice the folded edge

4. Close the page and slip-sheet



Name	Data Model	Marketing Features		
		Length of Time on Market	Number of Sales	Price
Condor 3 Condor Computer Corp. 2051 S. State St. Ann Arbor, MI 48104 (313) 769-3988	Relational	Since 1977	Over 110,000	\$650
dBASE II (Version 2.4) Ashton-Tate 10150 W. Jefferson Blvd. Culver City, CA 90230 (213) 204-5570	Relational	Since 1981	240,000	\$495
MAG/base III MAG Software, Inc. 21054 Sherman Wy. #305 Canoga Park, CA 91303 (213) 883-3267	Relational	Since 1981	Over 10,000	\$795
RL-1 DATA BASE (Version 1.21) ABW Corporation P.O. Box M1047 Ann Arbor, MI 48106 (313) 663-3011	Relational	Since February 1983	About 200	\$495
OPTIMUM (Version VII) Uveon Computer Systems, Inc. 300 S. Jackson #250 Denver, CO 80209 (303) 831-7000	Relational	Since 1981, but only sold to system houses until April 1983.	3,500	\$595
Day One Day One Software, Inc. 618 Shoemaker Rd. King of Prussia, PA 19406 (800) GET-DAY1	Relational	Since September 1983	About 600	\$695


```

**: SELECT THE FIRST HOUSE LISTED IN EACH NEIGHBORHOOD
SR: F008 NE P008 ! COMPARE CURRENT NGHD TO PREV. NGHD

**: SELECT FIRST HOUSE LISTED THAT IS $100,000 OR MORE AND
**: THE FIRST HOUSE THAT IS $150,000 OR MORE
SR: (F011<=100000 AND P011<100000) OR (F011>=150000 AND
    P011<150000) ! (Actually on one line.)

**: SELECT RECORDS WHERE FIELD 13 EQUALS TODAY'S DATE AND
**: 40% OF FIELD 10 IS GREATER THAN OR EQUAL TO 12.5
SR: F013 = SDT AND F010 * .40 >= 12.5

**: SELECT RECORDS WHERE CALCULATION IS GREATER THAN
**: CALCULATION 30 FOR PREVIOUS RECORD
SR: (F010+15)/33 >= C30

```

The asterisked lines describe the select record statement expressed in *MAG/base III's* report definition language.

functions.

MAG/base III's set of programs occupies most of four disks. One of these contains modules primarily intended for experienced programmers who wish to integrate data management routines with other programs written using the Microsoft Business BASIC or Digital Research CBBO (CBASIC) compilers, which are *MAG/base III's* native languages. The other three disks contain the core of the data management system itself. The most commonly used functions could probably be squeezed onto a single disk, but anyone expecting to need the program's full facilities should probably plan to use a hard disk.

MAG/base III's documentation comes in two parts for easy digestion. First is a "starter kit" that contains the program disks and three short manuals: an installation guide, a primer, and a desktop reference. These three guides are the same for all three versions of *MAG/base*. The rest of the documentation comes in a loose-leaf binder, the contents of which depend on the version you have purchased. For *MAG/base III*, the binder includes updates for the current version, a general reference section, segments on the report writer, programming aids, and *MAG/sam*, a separate subroutine system that can be used to index standalone programs in BASIC.

As its emphasis on BASIC might suggest, *MAG/base III's* roots are in the early history of "serious" microcomputer software; the developers first set up shop (under the name Microcomputer Applications Group) in 1978, and some of the most

As its emphasis on BASIC might suggest, *MAG/base III's* roots are in the early history of "serious" microcomputer software.

powerful versions of the program continue to run under CP/M. For example, the PC-DOS 2.0 version that I reviewed is restricted to about 32,000 records, but there are some CP/M versions that can theoretically accommodate almost a million records. (The version that runs under Digital Research's Concurrent PC-DOS recapitulates some of this power.) Also, *MAG/base III* currently makes no use of PC-

specific cursor or function keys.

MAG/base III does not include an on-disk tutorial, but it is not hard to install the program by reading the brief installation guide. You can specify available disk drives, printer columns, and memory (which helps to determine the maximum length of records *MAG/base III* will handle).

You can restrict entry to *MAG/base III* by using a password. The program includes modules that allow you to define different levels of access codes for files and even custom menus that may include external programs. For organizations in which several people with different access requirements will be using sensitive data, this ability is a significant advantage.

Once you have arrived at the main *MAG/base III* menu, you may choose among all the major functions and utilities. One necessary function is setting the current date, since *MAG/base III* does not pull it automatically from the operating system. In addition to entering, examining, and listing data from existing files, you may print forms and custom reports, and define new files, index keys, menus, passwords, and output formats.

MAG/base III comes with two predefined sample files of the customers and properties of a hypothetical real estate firm. Working with these files, which include several index keys to locate properties such as neighborhoods, prices, and number of bedrooms, is a good way to learn how to manipulate existing data files—perhaps all that some intended users of this system might need to do.

You can make queries and "browse" through the database using key fields quite rapidly; you can access all files and indexes you have created through the *MAG/base III* system by number from menus. Unfortunately, the program lacks full-screen editing; new field entries or corrections must be typed at the bottom of the screen, which is then updated. Another annoyance is having to terminate each function by typing END.

(Text continues following the Database Chart.)

Entry Editing Capabilities

None	Range Tests	Specific Values	Default Values	Table Lookup (to an Outside File)	Verify (Requires Data to be Input Twice)
—	Yes	Yes	Yes	Yes	No
—	Programmable	Programmable	Yes, may be automatically set to the values of the last record input; also programmable.	Programmable	Programmable
—	Yes	Yes	Programmable	Programmable	No
—	Yes	Yes, with high- level interface.	Yes	Yes, with high- level interface.	No
—	Yes	Yes	Yes	Yes	Yes
—	Yes	Yes	Yes	Yes	No

Entry Editing Capabilities (cont'd)			Adaptation to PC		
Required Field	Date Tests/Date Conversion	Other	ASCII Characters Only	Graphics Symbols	Color
Yes	Automatic; can do calculations on date field.	Checks data type.	Yes	No	Yes
Programmable	Programmable	No	Yes	No	A "SET COLOR TO" command allows users to vary colors on screen.
Yes	Yes	Checks data type, minimum and maximum length of strings.	Yes	No, except in predefined screens.	No
No	Date type and high and low values can be checked. Date arithmetic provided.	No	No	Yes, some symbols used in form generation.	No
Yes	Yes	No	No	Yes, limited.	Yes
Yes	Yes; includes validation for leap year.	Format validation for phone, social security, and zip code entries.	Yes	No	No

				User Interface	Files
DOS 2.x Subdirectories	Alternate Input Methods (mouse, etc.)	Files Across Multiple Drives	Function Keys		Method of
					Data dictionary or other means
Yes	No	Yes	Yes, used occasionally.	Commands	Yes; the form, or data dictionary, is inseparable from the file.
No	No	No	Yes; also programmable.	Prompting within APPEND and EDIT commands. At other times interface appears as " . ", indicating that a command may be entered.	Yes, data dictionary.
No	No	No	No	Menu-driven, verbal help screens, and prompts.	Yes, data dictionary.
No	No	No	Yes	Prompting and commands	Programmable
Yes	No	No	Yes, programmable.	Prompting	Yes, data dictionary.
No	No	No	Yes, for two-letter commands.	Menu-driven	Yes, specification files.

Files (cont'd)

Specification	Things You Can Specify				
Must files be built/modified only from data dictionary?	None	Field data	Tokens, aliases or synonyms	Index data	Permissions/security
Yes	—	Alpha, alphanumeric, dollar, date.	No	Yes	No
Structure may be copied to a new file. User may create a new file without defining it when it results from 2 files being joined via JOIN TO command.	—	Name, type, length, decimal places.	No	User defines indexes. Up to 7 index files may be opened and updated at once. Uniqueness is not required.	Programmable
No, may also be modified using BASIC.	—	Yes	Programmable	Yes	Yes, 32 access codes for each of 16 passwords.
No	—	Yes	No	Yes	No
No, may also be modified by relational commands.	—	Yes	Yes	Yes	Yes
No, may also be modified using DBF or DIF files.	—	Yes	Yes	Yes	Yes

					System
					Maximum No. Record Types per Database
Encryption	Relations	Validity tests	Error or prompting messages	Multiple views of database	
No	Yes, at command level.	Yes	Yes, broad range of error and prompting messages.	Yes, easily constructed from query language.	Unlimited
Programmable	Programmable	Programmable. System will automatically validate field type.	Programmable	Programmable	1 is default; can be increased with programming.
No	Yes, via reports and programming.	Yes	On screens only	Yes	5 files accessible from a single report
No	Can specify one-to-one, one-to-many, and many-to-many relationships. Relations can be virtual.	Yes	Not within data definition phase	No	Unlimited
Yes	Yes	Yes	Yes	Yes	10 files open simultaneously
No	Yes	Yes	On screens only	Yes	9 files open simultaneously

Specifications					Error Handling
Maximum No. Fields per Record	Maximum Record Size	Maximum No. Records per File	Maximum No. Records per Database	Maximum Field Size	
127	1,024 bytes	32,767	32,767	127 bytes	Field-by-field
32	1,000 bytes	65,535	65,535	254 bytes	Field-by-field
999	2,500 bytes	32,000	Limited by disk space.	50 bytes	Field-by-field
Limited by disk space.	Limited by disk space.	65,533	Limited by disk space.	1,023 bytes	Field-by-field
50	12,750 bytes	Limited by disk space.	Limited by disk space.	255 bytes	Field-by-field
891	3,000 bytes	65,534	Limited by disk space.	255 bytes	Field-by-field

Data Types and Maximum Sizes

Character	Numeric				Date
	Integer	Floating point	Money or dollars	Other numeric	
127 bytes	10 digits	No	10 digits	No	MM/DD/YY, DD/MM/YY, or YY/MM/DD
254 bytes	10 digits	No	Decimals handled automatically. Dollar signs must be programmed.	No	Programmable. A system date may be accessed.
50 bytes	14 digits	14 digits	14 digits	Incremental count for numbering records.	Yes
1,023 bytes	Range: ±32,768	32 digits	32 digits	Fixed-point decimal, scientific notation.	Yes; full date arithmetic available.
255 bytes	14 digits	14 digits	14 digits	No	Yes, can be input in any form; 10 output formats.
80 bytes	17 digits	16 digits	No	No	MM/DD/YY

Types/Sizes (cont'd)		Demo Version			Data Importing
Time	Logical	Available?	Cost	Limitations	
No	No	Yes	\$45	50-record limit	5 ASCII formats
Programmable	Yes	Yes, but only as part of system.	—	15-record limit	SDF
No	Yes	Yes	\$49, credited to purchase.	25-record limit	Comma-delimited format
No	Yes	Yes	\$50	50-record limit	SDF format. Also programmable through high-level language interfaces.
No	Programmable	No	—	—	Programmable; you can use system's Micro-English subsystem or a custom forms program to build sequential file.
No	No	Yes	\$5	25-record limit	DIF, dBASE II, DBF. Also via programming.

Data Exporting	Advanced Features				
	Back-up-ability/ Copy Protection	Audit Trails		Data Restructuring	
		Pre/post imaging	Activity or transaction log	Technique (Inherent/ separate program)	Adding or changing indexes
5 ASCII formats	Copy protected; can back up files with internal commands.	No	No	Inherent	Yes
SDF	Not copy protected	Programmable	Yes	Inherent	Up to 7 index files may be open at once through the use of commands.
Comma-delimited format; also programmable.	Not copy protected	Programmable	Programmable	Inherent	Yes
SDF; also programmable.	Not copy protected	No	No	Separate; data schema can be changed with supplied utility program.	Yes, with same utility.
Special format: BUILD TEXT FILE clause places fields in a CP/M or PC-DOS sequential file.	Not copy protected	Yes	Yes	Inherent	Yes
DIF	Not copy protected	Programmable	Programmable	Inherent	Yes

Features (cont'd)		Report Generation			
Linked or Multiple Update of Indexes and Files	High-level Language &/or Product Interface	Capabilities			
		Sorting	Aggregates (min., max., count, avg., percent, etc.)	Arithmetic (+, /, +, -)	Parameter passing
Yes	Yes, interfaces to several languages.	Up to 32 sort fields	Yes	Yes	Yes
Yes	Yes, to many programs. Exported files may be accessed by any MS-DOS-compatible language.	Index key can be a combination of fields, subject to a limit of 100 characters.	Programmable	Yes	Yes
Programmable	Yes, BASIC.	Up to 10 sort fields	Yes, through report calculation.	Yes	Yes
No	Yes; Pascal, BASIC compiler or interpreter, Macro Assembler and FORTRAN.	Any number of fields can be keys.	Yes	Yes	No
Yes	Yes, both. However, product interface is on paper, not on disk. But documentation provides all steps and code.	Up to 15 sort fields	Summaries only	Yes	Yes
Yes	Yes, with Day One application packages.	Up to 10 sort fields	Programmable	Yes, also exponentiation.	Yes

		Query Language			
Flexibility of output	Multifile access	Mass additions, deletions & updates	Load and unload	Execute stored scripts	Quality of output
Good	Yes	Yes	Yes	Yes	Excellent
Extremely flexible	Programmable	Yes	Yes	Yes. This is the real power of the program and the basis of its programming capability.	Excellent for experienced users
Quite flexible	Yes, up to 5 files per report.	No	Yes	Yes	Good, though creating custom report forms is cumbersome.
Good	Yes	Yes	Yes	Yes	Good
Not the system's strong point	Yes	No	Yes	Yes	Excellent
Very flexible	Yes, up to 9 files per report.	No	Yes	Yes, custom menus and reports.	Good

Report Generation (cont'd)					Procedural Language
Query (cont'd)	Report Formatter/Generator	Screen Dumps	Other	Built-In Applications or Examples	
Other					
Tabulation, statistics, and limited report writing.	Yes	Yes	No	No	Yes, but no loop commands.
No	More exotic formats require programming.	Yes	No	Yes	Yes
Can use MAG/base III data manipulation language in conjunction with BASIC programs.	Yes	No	No	Yes, sample real estate and customer files.	True procedural processing requires knowledge of BASIC, but menus provide access to most single-file functions.
No	Yes	No	No	No	No dedicated procedural language but uses various high-level programming languages.
No	Yes	No	No	Yes	Yes
Multifile browse	Both simple and complex formats available.	No	No	Yes	Prompted features provide procedural-language functions.

Performance Measurements

Time to Enter Standard Info.	Time to Execute Standard Task	Time to Perform Sort	Time to Extract Random Records	Size of Database Created	
				Number of records in employee file	Space compression
20 minutes	6 minutes, 50 seconds.	3 minutes	1 minute	500	No
30 minutes to write dBASE II programs, DOS batch files, and define dBASE II files. 1 minute, 30 seconds to automatically import data for all 3 files.	1 minute	2 minutes, 4 seconds with SORT.	1 second, using index.	500	No
About 1 hour, imported.	About 1 hour	12 minutes, 30 seconds.	2 seconds, using index.	500	Yes
2 hours, 13 minutes, imported.	About 15 minutes	25 minutes	Varies based on number of relations accessed and method of access.	500	No
Limited by typing speed plus 3 seconds update time between records.	About 15 minutes	Not an independent function	About 2 seconds	25	No
2 hours to import SDF files through dBASE II.	30 minutes to set up, but did not obtain satisfactory output.	12 minutes, 30 seconds.	About 2 seconds, using index.	500	Yes

Performance Measurements (cont'd)					Hardware/
Size (cont'd)	Number & Size of Ancillary Files	Degradation with Additional Indexes	Time to Create a Standard Report to Screen	Time to Execute a Standard Report to Screen	Minimum Configuration Required
Variable length of fields					
No	3 files with total of 1,015 records.	Minimal	2 minutes	1 minute	64K, 2 drives, DOS 1.1.
No	2 files, 640 and 680 records.	Slight at low volume levels, more significant at higher volume levels.	4 minutes	1 minute, 17 seconds.	128K, 2 drives, DOS 1.1.
No	1 per index; size dependent on key size.	Minimal	About 1 hour	1 minute for a single file, about 1 hour for a complex report.	128K, 2 drives, DOS 1.1.
Yes	None created.	Minimal	30 minutes after Report Editor had been learned.	25 to 40 minutes to sort, prior to commencement of printing.	128K, 1 drive, DOS 1.0.
Yes	Several created.	None	1 minute	2 minutes, 16 seconds for 14 records.	128K, 2 drives, DOS 1.0.
No	3 per database, requiring 7 percent additional space.	Minimal	30 minutes to 1 hour	About 1 second per record	128K, 1 drive, DOS 1.0.

Software	Subjective Evaluations				
Configuration Used in Testing	Documentation	Program Robustness	Flexibility/Ease of Use	Would You Buy This One?	Would You Accept It as a Gift?
PC-XT with 512K, AST BOARD with Superdrive RAMdisk.	Excellent; lucid and full of examples.	Excellent	Very flexible and easy to use	Yes	Yes
640K, 10MB hard disk, DOS 2.0.	Well written but does not adequately present the great power of the system to the user.	Excellent	User must gain experience with product. New on-disk tutorial and sample programs help, but becoming a high-level user requires commitment.	Yes	Absolutely
384K, 2 drives, DOS 2.0.	Complete, but not especially easy for novices.	Good	Most satisfactory if you already have programs and data in BASIC format.	I would consider it if I required a programmable interface to other programs and data in BASIC.	Yes; has useful examples of BASIC file management and data manipulation techniques.
640K, 2 drives plus hard disk, DOS 2.0.	Fair but dry and technical. Oriented to experienced user. Too few examples in advanced areas.	Reasonably solid	Fair. Query language less intuitive than some, and requires strict, artificial constructions. Real power of system is available only to programmers.	Only if I needed a database that could access a high-level language.	Yes, if I needed a database that could access a high-level language.
Compaq, 512K, 2 drives, DOS 2.0.	What's there is good, but it's insufficient.	Good	Very flexible, not easy to learn.	No, I don't need a multiuser on-line environment.	No
384K, 2 drives, DOS 2.0.	Well presented, but not specific to PC-DOS.	Good	Good for nontechnical users needing custom reports. Cumbersome for experienced users.	Would consider it for multifile requirements.	Yes

(MAG/base III continued)

MAG/base III has standard screens that are attractive enough, but they do not simulate most paper forms, since the data are simply presented in two columns—the first column is one field per line, the second is the list of numbered field names. This kind of standard formatting works quite well, however, with the quick-report

MAG/base III has standard screens that are attractive, but they do not simulate most paper forms, since the data are presented in two columns.

or "list" function. This function allows you to print all fields and records, or selected ones; the program prompts you for selected fields and index key ranges by name. The system automatically provides column headings for the report, which you can either print or direct to the screen. It arrives on the screen in a steady "roll," or, if you choose, one screenfull at a time. Although record selection in this list mode is limited to a single index key (which can include several fields, such as state, last name, then first name), it makes for very easy report generation.

Generating more complex reports and custom forms or form letters is a comparatively cumbersome operation. You must first create them with a text editor and then compile them. For users who don't have a program editor, MAG supplies an elementary one. It uses control keys for cursor movement as does *WordStar*, but you can work only with single lines of text. (Each previous line vanishes from sight once you press the Enter key.) The format of a report specification is rather cryptic: you

use two-letter abbreviations for functions and numbers to designate files and fields. Nonetheless, it turns out to be quite flexible; reports can draw from up to five files by index key. Setting up or modifying these reports, though, is not a job you would want to undertake casually.

Another PC test was to import several hundred records of data from three standard files. Since *MAG/base III* stores its own data in what is known as a comma-delimited ASCII file (also used by most versions of BASIC) and since this format was one of those in which the test data was available, I anticipated that bringing it into *MAG/base III* would be a snap. It was easy to create a blank personnel file in *MAG/base III*, and all that remained, I thought, was to give the data file to be imported a filename ending in .DAT. Next I instructed *MAG/base III* to create indexes for the file, which it appeared to do nicely. After the program pronounced its work at an end, however, the resulting index files were hopelessly garbled. My guess was that *MAG/base III*'s measure of the files' record lengths did not match my specifications, so it had shifted data from one record or field to another. After several hours of tinkering to no avail with the program's internal data specification file (which is, fortunately, well documented and can be edited by programmers), I decided to change the data file type to an "extended" version, that is, a file with fixed-length fields. The technical documentation luckily confirmed my hope that I could do so simply by changing one character and some record lengths in the data specification file. I then renamed my fixed length "system data format" file to correspond with the name of my previous *MAG/base III* file, re-entered *MAG/base III*, and, with bated breath, watched as the index creation routine worked over the new file. This time, to my relief, the program agreed that the file had 500 records and proceeded to index them all correctly. For all intents, records adopted by *MAG/base III* in this fashion then behaved like records created by the system, while still

remaining unchanged from their original format. In many applications, especially working with data files from mainframe systems, this method could be particularly valuable.

Life as a pioneer in the software business is not easy. A company like MAG with a fairly successful first-generation product cannot afford to rest on its laurels. *MAG/base III* is easy to use, but it could benefit from some reworking to provide access to function keys, a bit more error-trapping so that a user is never thrown out of the program even if a disk drive is unoccupied, and a better set of examples or tutorials demonstrating the more advanced functions of *MAG/base III*, such as multi-file reports. Even in its current form, however, *MAG/base III* may well be a good choice for organizations that use accounting software or other programs written in BASIC and that would like to be able to obtain custom reports or otherwise work with data through a sophisticated indexing system. BASIC may no longer be the language of choice for new systems develop-

MAG/base III may well be a good choice for organizations that use accounting software or other programs written in BASIC.

ment, but the amount of data stored in BASIC-compatible formats is vast. *MAG/base III* offers new and powerful ways of manipulating this data with relatively little time and effort. Particularly for BASIC users with some technical expertise, *MAG/base III* is a system well worth investigating.—Don Layman

RL-1 DATA BASE: For Professional Programmers

EMPL_NUM	DOMAIN=STRING 6 FORMAT=L6 TITLE="EMPLOYEE NUMBER"	KEYED=YES EDIT=YES
CUR_SALARY	DOMAIN=DECIMAL 9.2 FORMAT=P\$ZZZ,ZZ9.99 TITLE="CURRENT SALARY"	KEYED=YES EDIT=YES
AMT_CHANGE	DOMAIN=DECIMAL 9.2 FORMAT=P\$ZZZ,ZZ9.99 TITLE="AMOUNT SALARY CHANGE"	KEYED=NO EDIT=YES
DATE_CHANGE	DOMAIN=DATE FORMAT=DMM/DD/YY TITLE="DATE SALARY CHANGE"	KEYED=NO EDIT=YES
PERCENT_INCR	DOMAIN=DECIMAL 4.1 FORMAT=F4.1 TITLE="PER CENT SALARY CHANGE"	KEYED=NO EDIT=YES

The salary relation's field definitions as displayed by RL-1.

ABW Corporation's *RL-1 DATA BASE* is a powerful and flexible relational database management program with several unique features that make it suitable for high-level application development. Clearly not designed for beginners and nonprogrammers, *RL-1* offers an impressive spectrum of features. Its main claim to fame is a remarkably flexible high-level language interface that makes it possible for programmers to access the full range of *RL-1* features from several common high-level languages. However, as in most complicated systems, other areas pay the price for the most powerful features.

Unlike many database managers that

merely claim to be "relational," *RL-1* is a true relational system. Not only can you set up the standard tabular relationships, but you can implement complex virtual relations and normalized data structures as well. The program is capable of handling one-to-one, one-to-many and many-to-many data structures.

The system uses a memory-resident module that must be loaded before any functions will work. This module occupies slightly over 100K of RAM and evidently sets up a 40K "dynamic memory" for buffers. The *RL-1* module does not seem to interfere with any normal DOS programs, so it can be left resident while other programs are run (assuming the system has enough RAM).

Data Manipulation Language

Once the *RL-1* module is loaded, you can run several utility programs. The first usually would be DML, the package's data manipulation language. DML includes provisions for defining relations, editing these definitions, loading and unloading data from "flat" (nonrelational) files (presumably from other language systems), listing the characteristics of a

relation, selecting pieces of information from a database, updating information in a relation, and deleting records.

You can define a relation interactively from within DML, but this method is awkward and error-prone. It's better to use an outside text editor or word processor to define the data schema. Each field (called an attribute by *RL-1*) must be assigned a "domain," which would be called a data type by most other products. Available data types include integer, fixed-position decimal, floating-point real, string, date, duration (for date calculations), and logical. You can designate any field as an index key. A format can be specified for each field using an excellent selection of format strings similar to those in COBOL. The Edit characteristic determines whether the data in a field can be altered after creation, and a Title can be assigned to a field for use in report generation.

After defining the three *PC* test files, I began loading the data into *RL-1*. The LOAD command offers two options for importing data, a fixed-position method suitable for SDF and CBASIC files, and a free format that does not depend on keeping the foreign data in a fixed location within a line. *RL-1* successfully loaded the *PC PERSON.SDF* test file using the fixed-position method, but it took 1 hour and 9 minutes to do so! This time seemed particularly excessive since I was using a fast Tallgrass 35-megabyte hard disk. A glutton for punishment, I set up a RAM-disk and repeated the fixed-position load operation. With the RAMdisk, it still took 57 minutes, so the delay seems intrinsic to *RL-1*'s operation.

The free-form method fared no better. *RL-1* requires a nonstandard data format of quoted string fields separated by spaces, of which each line ends with a CR/LF pair. I converted the *PC* files to the format with a word processor. A three-record test file worked fine, showing that *RL-1*'s free-form method works, but 2 hours later (on RAMdisk!) the *PERSON* file had not yet been completely loaded. At this point, I gave up. *RL-1*, incidentally, displays

RL-1 DATA BASE

ABW Corporation
P.O. Box 1047
Ann Arbor, MI 48106
(313) 663-3011
List Price: \$495

Description: Relational
Requires: 128K RAM, 1 drive, DOS 1.0 or 2.0.

Records per File: 65,535

CIRCLE 759 ON READER SERVICE CARD

absolutely no messages of any kind to indicate the progress (or lack of same) in the loading process.

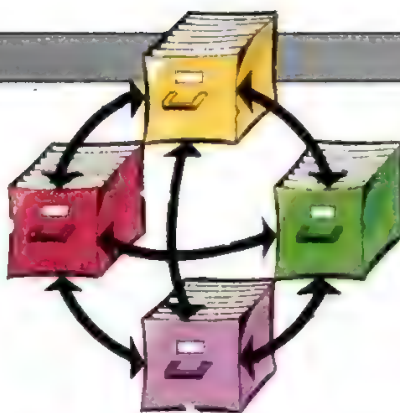
In fairness to ABW, a new release, Version 1.31, is now available, and the company claims it is several times faster than the one I was able to test. A "ten times faster" version is promised. This added speed is sorely needed. ABW also included several other enhancements in the new releases.

I encountered a few other surprises in loading the test files. The fixed positions start at 0, rather than at 1 as the manual indicates. Date fields have to be edited to include zeros rather than blank spaces or *RL-1* will indicate a "date conversion error" on the screen. *RL-1* supplied a nonsensical date value of 09/14/27 for all empty date fields (the programmer's date of birth, perhaps?). However, once I put everything into the exact form *RL-1* wanted, the data importation proceeded without hitch.

Query Language

DML includes commands that form a query language for accessing the information stored in the database. The **SELECT** command has such clauses as **FROM** to indicate the data source, **WHERE** to specify selection criteria (which can be complex), **ORDERED BY** to indicate sorted orders (which can involve more than one field), **JOINED WITH . . . OVER** to combine fields from more than one relation, **GROUPED BY** to specify aggregates, and **CREATE** to send the results to a new relation. You use the **UPDATE** command to modify data already in a relation, as, for example, when adding 10 percent to all stored costs. The **DELETE** command removes unwanted records.

The various DML commands can be used in tandem to specify reasonably complex data retrieval patterns. For example, the command **SELECT LAST_NAME, EMPL_NUM FROM PERSON ORDERED BY LAST_NAME TO LPT1** is all that's needed to produce a report of last names and employee numbers in last-



name order. *RL-1* formats such output in nice boxes but provides no pagination or other prettification. *RL-1* took more than 25 minutes to sort the 500-record *PC* test file before it began printing the output.

My overall impression of *RL-1*'s query provisions is mixed. While you can define meaningful inquiries, the number of commands provided is limited, and their syntax is more restrictive and confusing than those of many query languages I have used. However, even though the query language is not one of *RL-1*'s strong suits, you don't use it to build serious applications, so its limitations are not as serious as they could have been.

You would normally use a separate program known as **REDIT** (for relational editor) to input and maintain data. It is a nicely done full-screen editor that displays one record at a time. You use cursor control and function keys to move from field to field and to other records. **REDIT** includes a **FIND** command to locate records based on a field that has been keyed and a **SEARCH** command to access records by unindexed fields. **REDIT** is simple, fast, and easy to use.

Assuming the simple output produced by DML is inadequate for serious reports, ABW has included an unusual full-screen report editor, **RPE**. **RPE** looks like a spreadsheet and uses a similar metaphor for defining reports. You use function keys to "paint" the report layout on the screen. Specific keys are active only in certain circumstances and then appear highlighted in the command area.

RPE is flexible in other areas as well. For example, you can print fields at the beginning or end of a report, a page, or a

group (when the value of a field changes). An interesting provision allows you to specify the detail level for a field from 0 to 9. Every record of the input relation is printed in order of the detail level.

Once you have defined the report with **RPE**, you produce it with the **RPG** (report generator) module, using the predefined report layout. **RPG** allows you to identify selection criteria, groupings, and sort orders and to specify which relation to extract data from. You can run **RPG** interactively or create text files with the appropriate responses.

High-level Language Interface

RL-1 has one of the most powerful interface mechanisms to high-level languages I have seen. Programmers can access the core, or kernel, of *RL-1* with various languages to make use of the complete facilities of a sophisticated database manager. You can use all *RL-1* capabilities while working in the IBM dialects of macro assembly language, interactive interpreted BASIC, compiled BASIC, FORTRAN, COBOL and Pascal.

The interface method uses assembly language calls to the *RL-1* kernel. ABW supplies all the library modules to link your program with a compiler and a special binary file to load into memory with the BASIC interpreter. Although using assembly language calls from high-level languages can be intimidating, *RL-1* makes the access procedure itself straightforward and simple.

Actually using the interface, however, is far from simple. The interface defines 43 functions to access *RL-1* and the data stored in relations, each of which has its own rules for parameters that you must specify, codes that it returns to the high-level program from *RL-1*, and other matters that you must attend to. Many operations that seem simple and transparent when using *RL-1* itself become multiple-function-call chores when done by a high-level language program. Some of this complexity is caused by the User Work Area (UWA), a buffer area that stores data

to be sent to or retrieved from the relation. Data must often be converted from one form to another in moving into or out of the UWA, which requires extra steps.

Individually, the interface processes and functions are within the capabilities of serious programmers. Others will almost assuredly be in over their heads with the interface, but this part of *RL-1* is not intended for them. Even a good programmer, however, will have to spend quite a bit of time learning the ropes before making anything happen, much less tapping *RL-1*'s full power. Learning to use the high-level interface is an undertaking that you'd only do if developing a major application package. ABW itself offers accounting and other business software programmed using *RL-1*, so the system is certainly capable of significant complexity.

Future Enhancements

ABW says that Version 1.31 of *RL-1* employs a menu-driven and screen-oriented data definition language to define relations. On-line help is also included.

A new relational editor called RDT is used for inputting and updating data. This new utility is also easier to use than the current editor, ABW says. It is evidently modeled on the RPE report editor.

The most important enhancement is in speed. The performance of my review version of *RL-1* in accessing, sorting, and retrieving data would hardly qualify for the Indianapolis 500, so this improvement is welcome.

I believe *RL-1* has much to offer those interested in serious application development. While the basic program is not as easy to use nor as flexible as some competitive products (at least for beginning and intermediate users), it can be a major timesaver for the advanced professional programmer. Once you make the initial investment in learning the system, you can create powerful data management applications in the high-level language and *RL-1* combination at small cost. If you are a good high-level programmer, *RL-1* deserves your consideration.—Glenn Hart

OPTIMUM: Not for End Users

```

DEFINE (7.03B IBM PC) Defining: B:SALARY (NEW File)
Mode: Command (Unused: Fields=44 XR Fields=2 L-Lookups=10 X-Lookups=2 )

-----Add/Change Controls-----
| ESC - Exit Add/Change RETURN - Next Column or Option |
| ^H - Erase Character TAB - Continue 'Input Options' |
| ^X - Erase Entire Field space - Delete an Input Option |
-----

No Field Name Input Options Output Format R X V
-----
0 RECORD.NO L6 Y N A
1 EMPLOYEE.NO XD,B:EMPLOYEE, LAST.NAME L20 N Y A
2 SALARY V#####.## N N A
3 CHG.AMT V#####.## N N A
4 CHG.DATE DF,CURRENT.DATE I D/2 N N A
5 CHG.PERCENT V##.## N N A
6
>

```

OPTIMUM's definition screen for the SALARY file.

With any programming task, there is a trade-off between power and ease of use. The same is true of the various database management systems on the market. At the lowest level, you code a system almost from scratch using some form of programming language. You can develop all kinds of customized applications, but you are given very little assistance in the way of tools that can simplify the process. At the other extreme are systems that are better known as file managers. All the programming code is there, and it's simple to use, but there is little or no flexibility.

Picking the system you need is not too difficult—the trade-offs are clear. If you have a simple need and a single flat file to keep track of, a high-level language may satisfy 95 percent of your requirements. If you have complex files to manage, you

may have no alternative but to select a system with a lower-level language.

OPTIMUM fits into the latter of these extremes. It provides a low-level language for the development of sophisticated, unique database applications. (Be aware that an executive-type utility that helps you create simple database systems with *OPTIMUM* is also available—we'll discuss this later.)

Uveon Goes to Market

OPTIMUM was developed by people with data processing experience on large, powerful systems. Uveon is a 3-year-old company, and *OPTIMUM* is its only product. The system was initially developed for applications normally handled by minicomputers. From November 1981 to April 1983, Uveon sold only to systems houses developing multi-user on-line systems for vertical markets such as the food and beverage industry, but the immense success of *dBASE II* stimulated *OPTIMUM*'s entry into the end-user market. The product sells for \$595 and is targeted to users who have a lot of information to get into a computer quickly in an on-line mode and for whom batch processing and reporting are not primary concerns. A new release of the system is due this summer, and Uveon also plans to offer high-level programming classes (à la *dBASE II*) at a

OPTIMUM

Uveon Computer Systems
300 S. Jackson, #250
Denver, CO 80209
(303) 831-7000

List Price: \$595

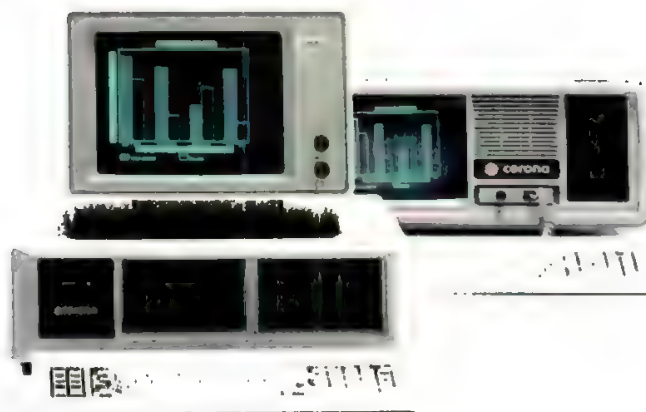
Description: Relational

Requires: 128K, 2 drives, DOS 1.0.

Records per File: Limited by disk space.

CIRCLE 793 ON READER SERVICE CARD

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cost of \$250 for 2 days of training.

The components of *OPTIMUM* are as follows:

- The Terminal Control Language controls the environment in operating-system style. Subsystems—such as the Form Processing subsystem, user ID maintenance, and access protection facilities—are invoked through this language.
- The Define File utility is a simple applications development tool to specify file information, describe file contents, build files, create data entry/maintenance forms, and build simple report selection forms.
- The Form Processing system includes a form editor, form compiler, form print utility, and form processor.
- The Micro-ENGLISH Inquiry/Reporting Language is a utility that operates on *OPTIMUM* files and performs selective retrieval, sorting, and reporting through the use of dictionaries.
- The Micro-ENGLISH Sentence/Report Editor is the front end to the Micro-ENGLISH processor and allows the design of reports.
- The Item Editor is a utility that operates within files to create and edit items (fields).
- File utilities create, clear, and inspect *OPTIMUM* files.

The package includes two disks. One is an *OPTIMUM* systems disk, the other, an *OPTIMUM* data disk. These disks came configured and ready to run on an IBM PC. The files were accessible through the normal PC-DOS commands and utilities. The disks were copyable using the DISK-COPY command. The system is also available on a variety of other computers operating under CP/M.

Struggling with the Manuals

Two manuals came with the system: the *Executive Series User's Guide* and the *Professional Series Programmer's Guide*. The manuals are vastly different, as they should be. The two-color *User's Guide* is designed for nontechnical eyes—it is nicely put together and is as understand-

able as a system with *OPTIMUM*'s complexity can be.

At the end of the manual, after the appendix, glossary, and index, is an "Applications Notebook," which takes an application (in this case, an order processing system) and develops it step by step in the documentation. The notebook is a super idea; unfortunately, its 184 pages



The Notebook is a super idea; unfortunately, its 184 pages are written in a language that's undecipherable to the average user.

are written in a language that's undecipherable to the average user. The sample system is more sophisticated than anything you can build with the Define utility, which is all you learn to use from the *User's Guide*. The "Applications Notebook" uses the Define utility to start out and then plunges you into the real systems tools such as performing interfile validation, using the cross-reference features, and optimizing code. In our opinion these tools are appropriate only for advanced computer users and systems developers.

Even though the *User's Guide* is great at getting a novice into a complicated sys-

tem (we managed to define the benchmark database file with its help), you can't do anything sophisticated with the knowledge acquired in this manual. What all this boils down to is that you can use the Define utility described in the *User's Guide* to create very basic flat file applications. But if this is all you want to do, there are certainly better systems on the market.

File Definition

To define a file, you first define its fields, specifying each field number, name, input options, output format, and which fields are to be cross-referenced with other files. *OPTIMUM* then asks you for an estimate of how many items will be stored in the file, whether you want the system to create a data entry form, and whether you wish to lock the records so that only one person can access them at once. *OPTIMUM* also asks if you want the system to create a print form and if you want to define video attributes.

The system then creates a dictionary for the file, updates the dictionary with the field names in the file, creates the main data file, creates a cross-reference file, builds the print form, and builds the data entry form. The filename is then added to the Function Display menu, and the file is ready for you to use.

While defining a 500-record EMPLOYEE file in this manner, we discovered that (although the documentation says nothing about it) *OPTIMUM* is not a traditional micro-floppy system. For all practical purposes, a hard disk or 8-inch drive configuration is required. We discovered this only by actually putting up the benchmark system using 5¼-inch floppies. The system stopped as it was creating the cross-reference file and issued the following message:

```
KDAM-86: CB86 Direct I/O  
Error!
```

We scurried to the *User's Guide* and found the following:

OPTIMUM KDAM error messages are fatal to the executing program. Some



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CIRCLE 326 ON READER SERVICE CARD

```
!SELECT
OPTIMUM SELECT (7.03B IBM PC) - (C)1983 Uveon, Inc.

->B:EMPLOYEE
->BY ZIP.CODE
->DISPLAY LAST.NAME FIRST.NAME DEPT.REC SALARY.REC
->HOLD
->
```

The **OPTIMUM** query language is used to sort and display the employee file.

indicate severe error conditions, while others indicate operational errors. Egads! There were no other clues. We turned to the Programmer's Guide and found the same obtuse explanation. After recreating the data diskette and redefining the **EMPLOYEE** file, following the instructions carefully, we obtained the phantom error message again. We called our contact at Uveon, who said, "Your diskette is full." Okay, back to the drawing board. We redefined the **EMPLOYEE** file, allocating space for 200 records. All was well so far. We then defined the **DEPTHIST** (department history) file, allowing for 50 records. Finally, we defined the **SALARY** file, also allowing for 50 records. Oh no! Another error message. The long and short of it was that **OPTIMUM** needs a hard disk to work with a respectable number of files.

(Incidentally, Uveon provided to us, for the benchmark problem, a program that would enable us to import the three **SEQ** data files—500 employee records, 640 department records, and 680 salary records—directly into our defined **OPTIMUM** files. But to use this program a hard disk is required, because a floppy system does not provide enough space for it.)

Updating and Reporting

Back at the main menu we decided to select the employee form and add some employees to the file. The ID or key field (in this case, the Employee Number field) was set apart from the rest of the record—the data entry form for the **EMPLOYEE** file was the one generated in the Define utility. We added three records to the file, using the ID, and then requested one of the three records by "key word" (the last

name, in this case). We picked a last name common to two of the three employees and were immediately supplied with information for both records showing the IDs from which we could choose. It was about this time that we were beginning to like the system.

According to the folks at Uveon, **OPTIMUM** was designed for an on-line multi-user environment. The company would like its product to be the **dBASE II** of this unique environment. The on-line multi-user emphasis is apparent. We were asked in our file definitions how to handle

OPTIMUM has the potential to be a very good system, but the PC version has a long way to go before it will work for less persistent users.

multiple accesses to the same record, and we were able to rapidly and conveniently add records to a file and retrieve specific records quickly.

What about the remainder of the benchmark? We knew almost from the beginning that it would not be completed. A Uveon representative predicted that it would take us 2 weeks to put the application together. Since we had already been told that the batch processing was not **OPTIMUM**'s strong point, we felt that we

were not doing the system a great injustice by not completing the problem. We briefly tested the batch capabilities with a three-record file and discovered that they were quite slow. To generate a screen report it took 3 minutes and 16 seconds to make the menu selections and wait for **OPTIMUM** to select, sort, and display the records. When the same report is produced on the printer, there are headings and formatting, including page numbers.

When adding records to the department history file we created, we were given a choice between entering either the Employee Number or key words to get a record. This enabled us to enter the employee number if we knew it or the employee's last name if we didn't. This option was available because when we defined the file, we specified an Interfile option that allows us to do a search in another file with cross-referenced key words.

OPTIMUM's Terminal Control Language and Micro-ENGLISH together made it easy to sort the **EMPLOYEE** file by any field we chose and to display selected fields from the sorted records in a report format.

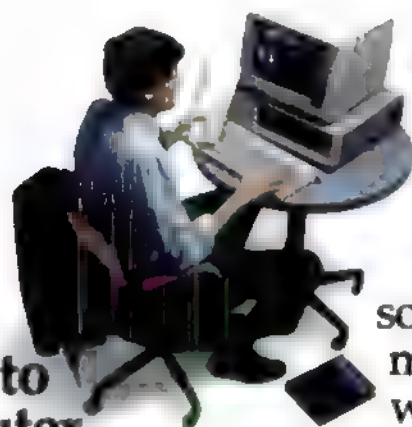
We briefly ventured into **SELECT-ED**, the Micro-ENGLISH editor, for true report-writing and found a complex subsystem that includes fairly comprehensive text-editing capabilities and a preformatted report layout. **SELECT-ED** was so complicated that it didn't seem to be worth the trouble. But it's difficult to judge how useful a facility like **SELECT-ED** would be once a user got accustomed to it.

An Uphill Battle

OPTIMUM is potentially a very good system. It is not for everyone, and the IBM PC version of **OPTIMUM** has a long way to go before it will work for any but the most persistent user.

Would we use **OPTIMUM**? It's hard to say. This system attempts to bring mini-computer database power to a microcomputer. The program was designed for a unique purpose: to provide an on-line,

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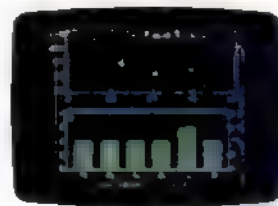
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Dynamic sorting and grouping of query output	Control of output format	Data can be customized to users needs
Spreadsheet cells may be defined in terms of <ul style="list-style-type: none"> • formulas • data table values • programs 	Cell can automatically retrieve information from tables and can perform intricate mathematical operations on that information	No need to rekey information or perform calculations separately
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* Partial List

Operating Systems: PCDOS, MSDOS, CP/M-86. Minimum RAM required: 192K. Graphics text processing and forms painting are optional integrated KnowledgeMan components.

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The Knowledge Manager from MDBS.

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CIRCLE 525 ON READER SERVICE CARD



multi-user database management system for under \$1,000. In our attempt to establish if a niche does, in fact, exist for this product, we spoke to a new user of the system. This user had selected *OPTIMUM* as a front-end to a mainframe system to handle on-line inquiries and updates. He was impressed with the variable-length field and record capability, which increases efficiency in an environment with a large database. But our user contact, who is a data processing professional, expects to embark on a 6-month programming task with a team of programmers. In other words, this is definitely not an end-user system. Uveon's hope that *OPTIMUM* will compete with *dBASE II* is therefore misfounded. It will take a long time and lots of development dollars to bring *OPTIMUM* (especially in the batch processing area) up to *dBASE II*'s level. But how does *OPTIMUM* compete with more powerful packages that are downloaded from minis and mainframes to micros? Not very well. For instance, the only reason we can think of that anyone would pick this system over *FOCUS* (a very powerful program that will be reviewed in the next issue) is because *FOCUS* costs over twice as much as *OPTIMUM*. Yet the user who selects either of these systems will spend so much money on systems development that the initial cost of the package will probably be insignificant when compared to the total cost of the project.

In summary, *OPTIMUM* will appeal only to those who need to work on a multi-terminal, on-line environment that demands a lot of on-line updating and inquiry and lightning-fast record retrieval without a great deal of batch processing. *OPTIMUM* will continue to have its largest sales to OEMs and system integrators in vertical markets, with occasional sales to technically minded individuals looking for an inexpensive, powerful programming tool for database applications.

—Barbara E. McMullen and John F. McMullen

Day One: The Promise of Youth

```
060106 080105
```

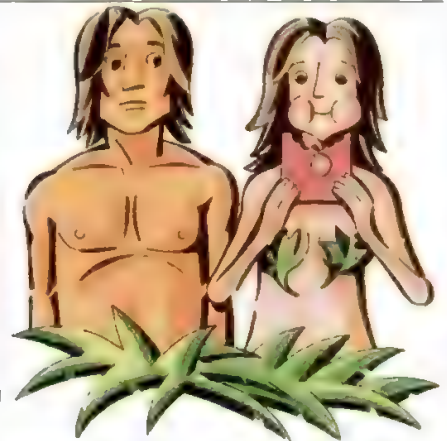
```
-- SORT BY --
```

```
( 1) File #           00
( 2) Screen #        00
      Enter 0 to Find Name
( 3) Sequence #       00
( 4) Fieldname        .....
( 5) Type of SORT      0
      0=Ascending, NO Totals
      1=Ascending, w/Totals
      2=Descending, NO Totals
      3=Descending, w/Totals
```

A *Day One* menu is used to specify sort criteria.

For a new product to succeed in today's crowded data management software market, it has to offer something special. This might be ease of use, technical power and flexibility, security and reliability, conformity to existing standards, good marketing and support for dealers and purchasers, or price. The premier offering from Day One Software, Inc., is not breaking new ground with its price of \$695, but it has several interesting aspects. The *Day One* system shares both the promise and the growing pains of youth.

The development of *Day One* began about 1982, inspired in part by data management software then running on main-



Day One

Day One Software, Inc.
618 Shoemaker Rd., #201
King of Prussia, PA 19406
(215) 337-8255

List Price: \$695

Description: Relational

Requires: 128K RAM, one 360K drive
(two recommended).

Records per File: 65,534

CIRCLE 758 ON READER SERVICE CARD

frame computers and Hewlett-Packard minis. Several critical modules have been written in assembly language, with additional development taking place in compiled BASIC and, most recently, in C, particularly to prepare a UNIX version.

According to the developers, about a thousand copies of the program had been sold, mainly in the Philadelphia area, prior to national marketing in 1984. In a wise attempt to offset competition from major companies that sell their databases by mail

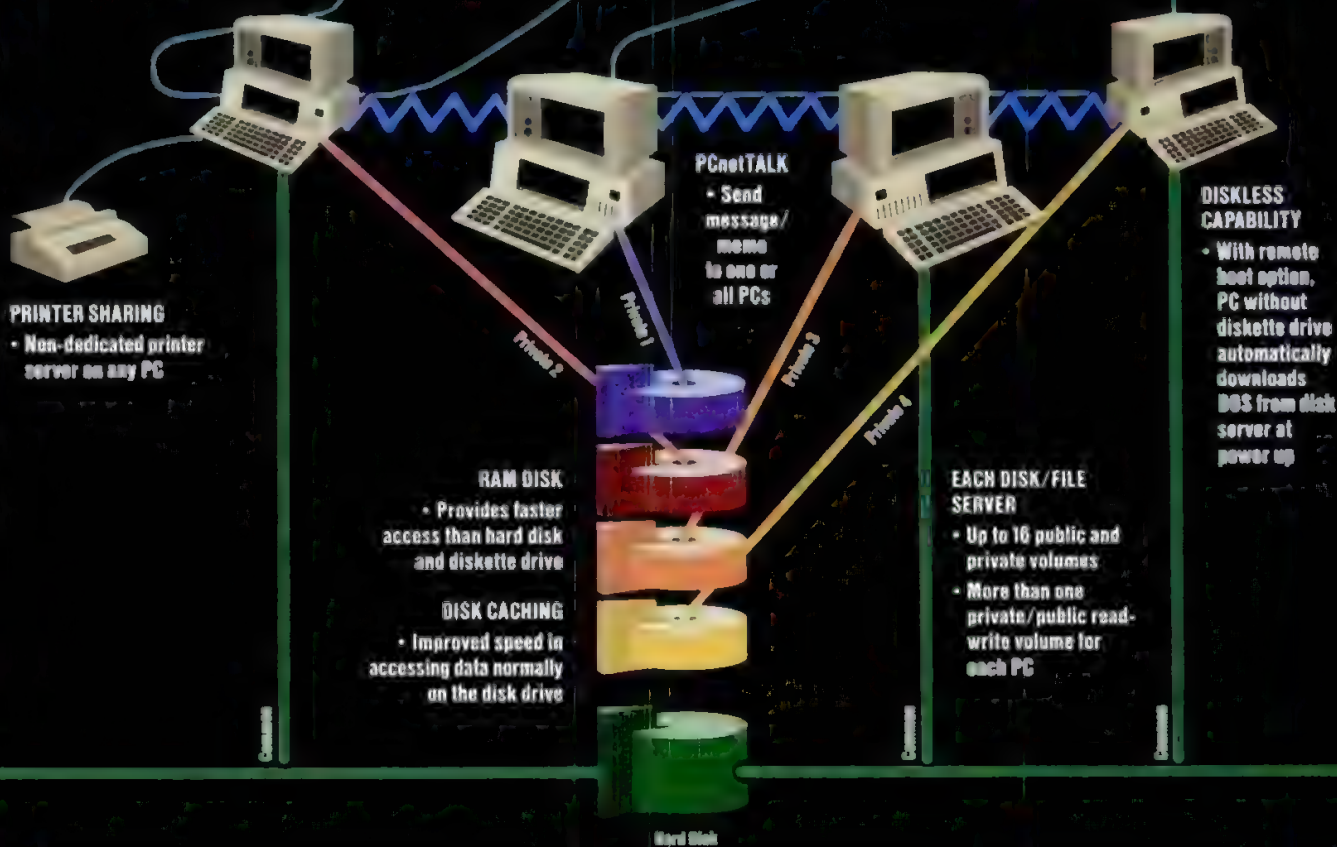
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CIRCLE 412 ON READER SERVICE CARD

order, Day One has designed some of the snazziest software packaging around. The developers are also working (mainly in-house, rather than with outside developers) to create derivative programs for mail lists, inventory management, medical offices, and other vertical applications.

A Smooth Start

If you need a database for relatively simple applications, it really is possible to do useful work with this program on day one. This is owing in part to a good, brief tutorial program that introduces database terms and concepts in a clear fashion and provides limited interaction in creating and using a new file.

Installing *Day One* requires that you specify both a "personal name code" and an ID number. It's best to keep these short and simple, because you must use them every time you enter the program, whether or not your application needs password protection (presumably as a measure to discourage software pirates). Once you pass this protective barrier, you arrive at the main menu, which is sensibly divided into setup functions, such as "Describe Your File," and corresponding "action" activities, like "Fill Your File."

All functions on the main menu can be selected by number, and if you need help, you can type HE at the command line, or—a currently undocumented feature—you can press the F1 key. The help offered is fairly context-sensitive. Choosing "Describe Your File," for example, brings up a submenu where pressing F1 will explain the options, which include not only defining new files, but also adding fields and rearranging screens for existing files (not an easy task in many systems).

There is a quick, semiautomatic way of creating specifications for new files, in addition to a more detailed method that can later be used for fine-tuning. The options here include validation criteria, screen number and position, and various other refinements that you might well want to make after giving the system an initial shakedown. Each file, record, and

other data element is actually a database specification record within *Day One*, so file modifications are much like editing an ordinary bit of data.

Full-screen editing is not available—you can't move easily from field to field using cursor keys (the company does expect to include this capability in a future edition).

There are a couple of oddities in the command structure that you will get used to only gradually, such as getting back to a command line by pressing the caret key (^), or breaking out of a routine by pressing Ctrl-E, neither of which is clarified on

Day One has designed some of the snazziest software around.

help screens or in the manual.

Despite these quirks, this program has impressive capabilities. Although I could not test all of *Day One's* advanced features, the system is designed to handle up to 9 files in a single report, handle records with as many as 891 fields, store as many as 10 qualifying selection criteria for browsing, and produce many custom forms. Most output can be directed to either a printer or the screen, and reports can also be sent to a text or DIF spreadsheet file or can be used to create a separate *Day One* data file. All these functions are available by picking numbers from a menu and filling in blanks, giving *Day One* the functional equivalents of many features found in data management systems with true procedural languages.

File Conversion

When it came time to run the official test data for this series, it seemed we would have a problem. Currently, *Day One* does not read standard system data format (SDF) ASCII files from the outside world, although a conversion utility for

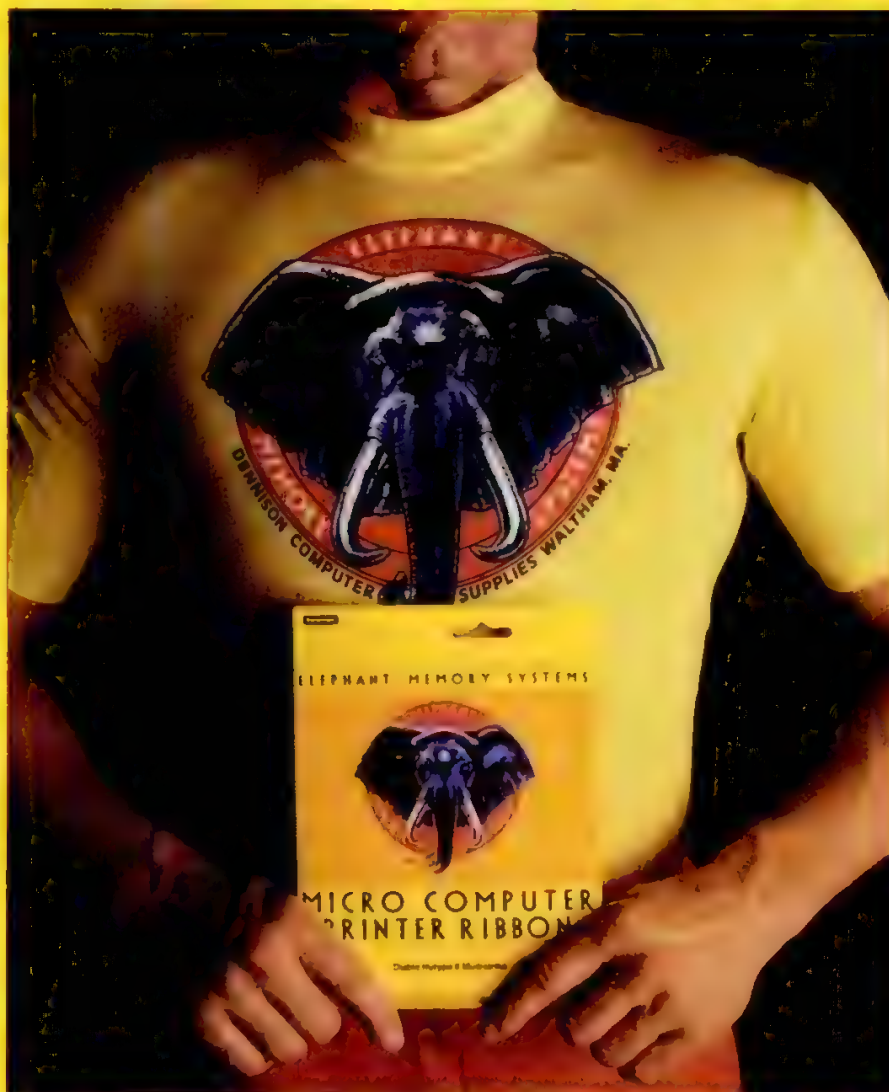
both these and for mainframe files in the EBCDIC character set is being tested at *Day One*. Fortunately, though, *Day One* does proclaim its capability to use not only *VisiCalc*-style DIF files but also files from *dBASE II*. Since *dBASE II* was able to read SDF files, I converted the data into *dBASE II's* DBF files and then turned *Day One* loose on the problem.

The *Day One* DBF file converter is quite sophisticated; it allows you to specify changes in your file setup as you perform the conversion. It also allows you to specify index key fields, since it creates its own indexes in the process and appends them to the data file. Two of the *dBASE* files (those with the most records, but the shortest record structures) were read by *Day One* without a hitch. The third file was converted too, but the conversion module announced 50 records short of the end of the file that it had a "BASIC error 6 in Line 5875" and then permitted a graceful exit to the master menu.

This difficulty, along with some problems in creating multifile reports, obliged me to call the publisher's toll-free hotline. I was favorably impressed by the quality of advice, the company's willingness to ship an updated edition of the software, and the follow-up checks on whether my problems had been solved. Although some of the glitches remained, even in the new edition (fortunately quite compatible with my previous files), I was left with a sense that problem reports from any source would be taken seriously.

Day One is the sort of system I'd like to see succeed in its attempt to enhance and preserve the diversity of offerings in an era of heavily capitalized (and usually less daring) big names. Day One Software is trying to carve out a niche through dealers and with clients who need software tailored for vertical applications. Shoppers who have good local support and who need the power of a multifile data management system that doesn't require a high level of technical knowledge should consider putting *Day One* on their comparison-shopping list. —Don Layman

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HARDWARE

ALFRED POOR



The Monroe 2000 and the Tandy TRS-80 Model 2000 offer high-speed computing based on the 80186 processor. But is the loss of PC-compatibility too high a price to pay?



Monroe & Tandy Strike Out On Their Own

MONROE AND TANDY

The MS-DOS desktop computer market is getting crowded. Many manufacturers are content to let Big Blue clear a path for them and then proclaim "total compatibility" as their ticket to join the parade. As a result, though, they run the risk of getting lost in the crowd.

A few brave companies have decided on a different tack. They are attempting to explore strange new designs, to seek out new problems and new solutions for them, to boldly go where no computer company has gone before.

Tandy and Monroe are two such explorers. Leaving the trek toward PC compatibility to their more timid peers, they have instead focused on performance and other design features. What makes their decision so surprising is that both companies have conservative reputations to protect. Tandy (Radio Shack's corporate parent) helped get the microcomputer market off the ground with its TRS-80 Model I, but it has rarely shown much interest in forefront design. Monroe, a big name in calculators and other office equip-



Monroe 2000

Monroe Systems for Business
The American Road
Morris Plains, NJ 07950
(201) 993-2000

List Price: \$4,295 with two disk drives; \$6,095 with 10-megabyte hard disk. (Both versions include amber monitor.)

CIRCLE 751 ON READER SERVICE CARD

Tandy TRS-80 Model 2000

Tandy Corporation
1400 One Tandy Center
Fort Worth, TX 76102
(817) 390-3011

List Price: \$2,750 with two disk drives; \$4,250 with 10-megabyte hard disk.

CIRCLE 750 ON READER SERVICE CARD



An inside look at the Monroe 2000 reveals its low-profile design, built-in fan, and two different sizes of connectors.

ment, has never been well known for its microcomputers.

Yet both firms, without riding IBM's long coattails, have created microcomputers aimed at the business market. Both have given their computers the name "2000." Both computers are based on the 80186 microprocessor, and both are geared for high performance. The question is whether they succeed well enough to justify choosing them over the "compatible crowd"? Since each machine has a character of its own, the best way to give a fair evaluation of them is to consider each one separately.

The Monroe 2000

The Monroe 2000 is designed for low-profile functionality. It has a built-in fan that is a bit noisy. There is a small reset switch on the back of the computer, but it is not labeled. I would have preferred to see it clearly marked to reduce the risk of someone pressing it "just to see what happens." Monroe deserves kudos, however, for showing that keyboard cables can be intelligently routed—the cable plugs into

a recessed spot in the *front* of the box.

The keyboard has 92 keys, arranged with ten "program" function keys along the top left edge, along with four more "user function" keys. The cursor-control keys are set off by themselves between the letter keys and the numeric keypad. The numeric keypad has the same key assignments as the IBM PC, including an additional set of cursor-control keys and a second Enter key. The typewriter portion of the keyboard is laid out like the IBM PC's, with a few exceptions. The left-hand Shift key and the notorious Backslash key have been switched, an improvement unless you are already acclimated to the PC version. The Return key is labeled as such. The CapsLock, NumLock, and Scroll Lock keys are lighted to show their status, but the lights impart a "clunky" feel to the keys, and they do not offer the same resistance and release as the rest of the keys do. The other keys have a slightly mushy feel, but their tactile feedback is adequate.

A standard Monroe 2000 comes with 128K RAM, but this can be boosted to as much as 896K (a full 256K more than the

IBM PC). The computer has 6 full-size expansion slots, as well as three short slots used by expansion options such as the Z-80 card. You can also add additional serial ports if you need them, although the standard configuration includes one parallel and two serial ports. One item you won't have to add is a clock/calendar card—it's already included.

The floppy disks are double-sided, double-density, with double the tracks (80 per side). As a result, disks hold a nominal 720K—712K after MS-DOS 2.0 formatting and 640K under CP/M-86. This gives you more than twice the storage space of an IBM PC floppy disk (354K under DOS 2.0).

The monitor comes with a pedestal base and has an acceptable character set. No demo programs were provided to test its graphics capabilities, but with a resolution of 690 × 400, it should perform quite well. One nice surprise is that graphics capabilities come standard with the Monroe 2000, instead of as an option costing hundreds of dollars.

Operation

The first thing I noticed about the way the Monroe 2000 works is its speed, at least when it comes to calculations. When I ran the prime number program used in other computer tests at *PC Magazine* (listed in "A Garden of Portables," *PC*, Volume 3 Number 6), it rocketed through in only 25 seconds. This is one-third the time an IBM PC requires. It is also the fastest time I have ever encountered on an MS-DOS machine. The MAD-1, another 80186 machine, is 50 percent slower, at 38 seconds (see "A Sporty Compatible," *PC*, Volume 3 Number 14).

The Monroe 2000's speed comes, in part, from its 80186 chip, which is quite different from the 8088 processor used in the IBM PC and most of its clones. The 8088 has 16-bit internal registers, but can retrieve and send only through an 8-bit data bus. The 80186 is a "true 16-bit" processor in that both its internal and external buses are 16-bits wide. The

80186 is an improvement on the 8088 chip, since it has more commands in its instruction set, and it incorporates more electronic components in its design. As a result of this larger integration, an 80186

Graphics capabilities come standard with the Monroe 2000, instead of as an option costing hundreds of dollars.

design requires fewer supporting chips. All these factors help it run faster.

Good Design Features

Other aspects of the Monroe 2000 stand out as examples of good design. For example, the operations manual instructs you to leave the disk drives empty when you turn on the power. The computer goes through a quick self-check, and if all goes

well, the screen prompts you to insert a disk. Just to give the self-test something to do, I powered up with the keyboard unplugged. Not only did the computer recognize that something was wrong, it displayed a clear prompt on the screen explaining that something was wrong with the keyboard.

When prompted for the system disk, all you have to do is insert the disk and close the drive door—the operating system will load and you're ready to go. You cannot close the disk drive latch unless a disk is in the drive. This means that you can tell at a glance if a drive is empty—if the latch is down, there must be a disk in the drive.

The computer comes with two operating systems, MS-DOS and CP/M-86 DPX. According to Monroe, the "DPX" means that it can work with dual processors. An optional Z-80 board tacks onto the motherboard and allows you to run 8-bit CP/M-80 programs. With the CP/M-86 DPX operating system, you can run 8-bit and 16-bit CP/M software under the same operating system.

The manuals show good attention to detail. The *Guide to Operations* includes detailed set-up instructions, although it

Comparative Speed Test

Prime number test	Monroe 2000	IBM PC	Tandy TRS-80 Model 2000
Display on	0:25	1:07	2:13
Display off	0:06	0:17	0:07
Recalculate spreadsheet	0:04.3	0:19.5	0:05.1
Format disk	2:10	0:42	1:25
Load <i>WordStar</i>	0:07 (CP/M-86)	0:06 (PC-DOS)	Not available

MONROE AND TANDY

1 A peek inside the Tandy TRS-80 Model 2000's white plastic cover exposes its metal foil lining, installed to reduce possible RF interference.

2 The Tandy TRS-80 Model 2000's motherboard is slung out of sight underneath the computer like a spare tire under a pickup truck. This effectively gets the board out of the way, but makes access extremely difficult.

3 Unhooking the bottom of the Tandy TRS-80 Model 2000's case affords a better view of the computer's motherboard. The author suggests leaving the removal and replacement of the motherboard to a trained technician.

also points out that "your Monroe representative will perform the initial set-up of your system." Under the installation section, Monroe gets more specific than any manual I have ever seen; it recommends placing the machine on a table with a surface area of at least 25 inches by 50 inches and capable of holding at least 50 pounds. It also recommends using a dedicated power line providing three-prong, grounded, 115-volt electricity, and "a low-static-electricity environment." Tutorials for MS-DOS and CP/M-86, a trouble-shooting guide, a glossary, and technical appendixes with memory maps, port pinouts, and disk format details are also included with the Monroe 2000.

The Other Side

On the darker side, a number of details detract from the effectiveness of the Monroe 2000's design. Some are merely cosmetic, but others go deeper.

To start with, the machine reviewed was a hard disk version. The *Guide to*

Operations made no mention of how to work with a hard disk, so I had to search through the MS-DOS manual for help. Near the back of the book, I found a section that explained a few of the hard disk utilities. I tried using the HDPART utility to divide up the disk, but had problems when I tried to set the entire space aside for an MS-DOS partition. The computer kept telling me that it found only 8 megabytes of storage space available. I eventually discovered that specifying a second partition of 0 size made the entire 10 megabytes available in one partition.

Another utility was designed to convert IBM PC disks to the Monroe format. When I tried to run it (so that I could copy the benchmark program), the screen kept asking me to put the IBM format disk in the B: drive, and then it would tell me that it couldn't find the B: drive. Like the IBM PC-XT, the Monroe designates the floppy drive as the A: drive, and the hard disk is considered the C: drive. Unlike the XT, however, the Monroe considers the A:



drive to be the A: drive, no matter what. (The XT can reassign the floppy drive as drive B: if needed.) The IBM format conversion utility was evidently coded to always look for the B: drive, so I couldn't get it to run.

A Monroe spokesman informed me that the utility has been rewritten and that this problem has been fixed. Unfortunately, the revised version did not arrive in time for me to test it. This is a shame, because the utility sounds useful. Apparently, it prompts you to specify one of three formats for your IBM disk: 8-sector single-sided, 8-sector double-sided, or 9-sector double-sided. With the utility, you should be able to convert just about any DOS 1.1 or 2.x file into the Monroe 2000 format.

Disk operations are not particularly fast. The Monroe takes a long time to format a disk under MS-DOS. Although its disks are only twice the capacity of an IBM PC disk, it takes 2 minutes and 10 seconds to format a disk, which is more

than three times as long as the 42 seconds a PC requires. Under CP/M-86, it took 7 seconds to load *WordStar*, as opposed to 6 seconds for a PC under MS-DOS.

As evidenced by the prime number benchmark, the Monroe 2000 does calculate quickly. I also had it recalculate a spreadsheet with 100 rows in ten columns, where each cell is defined as 1.1 times the value to its left or above. The Monroe whizzed through this in just 4.3 seconds (using *SuperCalc*² under MS-DOS). In comparison, a standard IBM PC (using *VisiCalc*) takes 19.5 seconds, almost five times as long.

Software

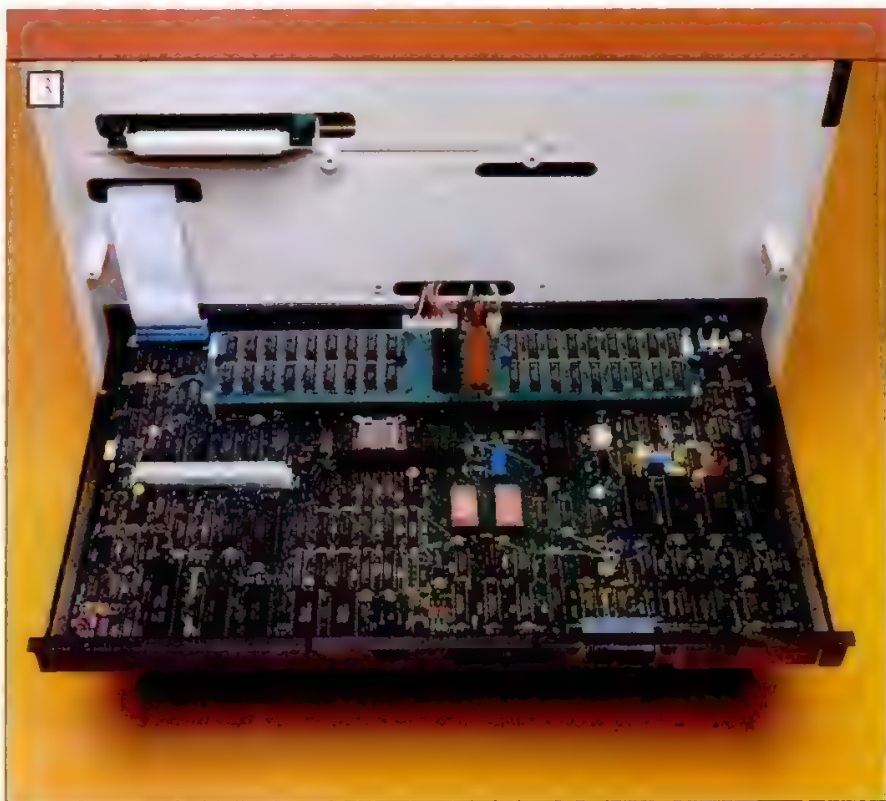
Of course, without software, even the fastest machine is useless. For testing, Monroe provided me with *SuperCalc*² (under MS-DOS), *Condor 3*, and *WordStar* (both under CP/M-86). The company also sent me a fat listing of programs available for its computers, but only 22 were for the 2000. Four of these are from third-

party sources, the rest are from Monroe (including the three that were provided with the review unit). A number of these programs are vertical-market-type applications (such as a program to manage a wine cellar), so there's not much to choose from at this point. A Monroe spokesman said that an update to the directory is being prepared, and it will list about 40 additional packages for the 2000. This list should be ready by the time you read this, so you might want to contact Monroe to check on what programs have been added.

In sum, the Monroe 2000 is an expensive computer with limited software availability (at least for now). Aside from its calculating speed, there is little to love about it, but it does not appear to have any fatal flaws, either.

The Tandy TRS-80 Model 2000

If the Monroe 2000 is a steady presentation of a consistent standard, the Tandy TRS-80 Model 2000 represents a paradoxical combination of conflicting design



strategies. This shows up both in the performance and in the physical features of the computer's design.

An illustrative example is that the processing speed of the Tandy's 80186 processor is offset by the way the high-resolution display works. The unit I tested was equipped with the high-resolution graphics option (\$449 extra) as well as the extra memory to permit high-resolution graphics in color (\$199 extra). The CM-1 Color Monitor displays the 640 × 400 graphics beautifully, creating clear and striking color images.

On the other hand, the display slows down the machine's performance. When I first ran the prime number program, I could not believe the results: 2 minutes and 13 seconds. That was fully twice as long as the IBM PC's time! Where was the 80186 processor's vaunted speed?

I then removed (by changing to REMark statements) all the lines that updated the display during the looping part of the program. This time the Tandy came through in an appropriately slick 7 seconds (compared with 6 seconds for the Monroe and 17 seconds for the IBM PC). This indicates that the beautiful display extracts a tremendous penalty in operating speed, more than negating the gains of the advanced processor design.

I also timed how long it took to list the 38-line prime-number program on the screen (after I had already filled the screen with a previous listing of the same program). It took 16 seconds (fewer than 3 lines per second), while the Monroe performed the feat in just 2 seconds.

The Tandy Model 2000's split personality also shows up in the clash between its desire to present the image of a solid, high-powered, executive workstation, and Tandy's reputation for affordable personal computers for the home. Evidence of an effort to create an upscale product shows up all over the place. Perhaps most prominent is the absence of the words *Radio Shack* on its nameplate. Instead, this is the "Tandy TRS-80 Model 2000," a clear attempt to disassociate this computer from

the hobbyist-oriented Radio Shack Model I and Color Computer. With this in mind, executive-type options such as a mouse, a monitor pedestal, and even a floor stand are available for the computer, so that you can configure your machine to get the most productivity out of the minimum amount of desk space.

Even the manuals are much improved over earlier Tandy offerings. Gone are the familiar, brown padded-vinyl, 11-inch

**The processing
speed of the
Tandy's 80186
processor is offset
by the way the high-
resolution display
works.**

binders. They have been replaced with colorful, attractive 9-inch manuals in slip-cases. The instructions are clear, and the clean, typeset page design is easy to read. (Some of the manuals for the application programs appeared to have been reduced from an 8½ × 11 format, but the print was still large enough to read easily.)

On the other hand, the computer is still made of Radio Shack white plastic. A peek inside the case reveals a metal foil lining to reduce RF interference. The designers tried to make the package more attractive than earlier TRS-80 efforts, but the Model 2000 is a near-miss at best, with its oversized, red, illuminated power switch dominating the front.

The Tandy's "ergonomic design" results in a tiny keyboard (a full 2 inches shorter than the PC's) with 90 keys crammed together. The arrangement of keys is unique, with 12 function keys in groups of four on the top row and four cursor control keys between the Enter key and the numeric keypad. The "strange" punctuation symbols (the tilde, for example) appear on the number keys of the

numeric keypad. There are slots at the top edge for function key labels, but instead of making them one long strip, the designers chose to break them up into three little 2-inch by ½-inch sections, which are hard to handle and probably easy to lose. The nicest things about the keyboard are its lighted Caps and NumLock toggle switches, and its cable, which attaches to the front of the computer.

Tandy seems confused about whether or not you should be allowed to touch any part of the computer besides the power switch and the keyboard. In a significant departure from its past policy, you may now install some items yourself without voiding the warranty. You may put in memory boards by yourself (and bring the total memory from the standard 128K to a maximum of 768K). You can even add extra memory to cards, which come with 128K with room for an additional 128K. The catalog says that this additional card memory is "user installable" but adds that "installation by our technicians is recommended." When it comes to expanding the motherboard memory, though, the familiar reminder "Installation required, not included" returns.

The reason for the difference is that you can install cards without taking off the cover. The cards use an odd connector (I've never seen one like it) with three rows of 32 pins. There are four slots (plugs?) available, and a machine with 768K memory and the graphics card would still have a slot left over. The motherboard, on the other hand, is slung under the case like a spare tire under a pickup truck. A connector in the middle of the board hooks up with the disk drives and expansion cards "upstairs" in the case and, from my timid peeking, I would gladly leave its removal and replacement to a trained technician. All things being equal, of course, I would prefer to be able to get at it myself; I hate to pay someone else for the simple task of plugging in a batch of memory chips.

One remaining area of conflict is the issue of IBM PC-compatibility. Tandy



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CIRCLE 226 ON READER SERVICE CARD

does not claim that the Model 2000 will run IBM software, and one glance at the expansion card connector shows that it is not hardware-compatible either. Also, the Tandy uses a different disk format than the IBM PC, providing a nominal 720K (714K after formatting) per disk—more than twice as much as the IBM PC's disks hold. The Tandy Model 2000 uses 96 tracks per inch on double-sided, double-density drives.

Tandy has not completely ignored IBM compatibility, however. While the Monroe refused to even look at an IBM formatted disk, the Tandy Model 2000 can read and even run programs from a DOS 2.0 disk. I was able to load and run the prime-number program directly from an IBM disk (after booting the computer with the Tandy MS-DOS operating system). The only hitch was that the computer froze after each run and had to be reset. Still, this means that you should be able to at least transfer data from an IBM PC to the Model 2000 (provided that the data is stored in ASCII text files). While this is inconsistent with Tandy's disregard for IBM compatibility, it's still a plus.

Tandy has arranged for many IBM programs to become available in the Model 2000 format.

Tandy has also arranged for many popular IBM programs to be made available in the Model 2000 format. The machine provided for this review came with *dBASE II*, *PFS:FILE*, *Multiplan*, and *Videotex Plus* (a communications package), all bearing the Tandy logo. Tandy also has the *Multimate* word processing package, the *MAI/Basic Four* accounting programs, and some Infocom adventure games.

To make even more programs avail-

able, Tandy has made arrangements with third-party publishers so that you can order other packages through your local Radio Shack store, even though the publisher supplies the support. *WordPerfect* and *WordStar* are two programs that are already available through this "Express Order Software Service." The service is new and relatively few programs have been included so far, so you'll have to check with a Radio Shack store to find out if they have what you need.

Performance

As mentioned above, the 80186 processor works quickly when it is not being held back by the color display. The spreadsheet test gave further evidence of this, as the Model 2000 recalculated the 1,000 cells in 5.1 seconds (less than a second slower than the Monroe).

Since *WordStar* was not included with the machine (nor was any other word processing program), I tried loading the IBM version to test the disk speed. Unfortunately, the Tandy Model 2000's PC-compatibility did not extend that far, so I was not able to get a time for this operation. The disk format utility was fast, however, clocking in at 1 minute and 25 seconds. This is just about twice as long as the IBM PC format utility—reasonable given the fact that the Model 2000's disks have twice the capacity. One nice touch on the format routine is that the screen displays the program's progress as a series of dashes in a line. This tells you that something is happening and allows you to estimate how long you'll have to wait until the job is complete.

The Tandy Model 2000 also goes through a self test when you turn it on. To check it out, I tried the same trick I tested on the Monroe; I pulled out the keyboard cable before powering up. The Tandy blithely went ahead, loaded DOS, and waited for my response to the date prompt. Clearly, this machine's power-up diagnostics are less comprehensive than the Monroe's.

The disk drives have an unusual door

design that works like more standard arrangements: first you insert the disk until it clicks in place, and then you push a latch down. There is no mechanism to keep you from closing the door on an empty drive,

Both machines are fast, have quality graphics, and high-capacity disk drives.

however. Also disconcerting was the fact that the disk activity lights glowed constantly; when a disk drive was accessed, its light merely glowed brighter and then dropped back to a lower intensity when it was finished. Perhaps there was a small voltage leak in my review machine, or perhaps it is supposed to work that way. In either case, I would feel more comfortable if the lights were either on or off, not in between.

The Tandy TRS-80 Model 2000 is a reasonably priced machine with the advantage of wide availability. There are now 1,100 Radio Shack Computer Centers, and computer items are also sold at some regular Radio Shack stores. While the Tandy shows some of its low-price heritage in its cramped keyboard and plastic case, it does pack a computing punch with its 80186 design, and it can handle a large memory as well.

Different or Better?

It is fine to explore the strange new worlds defined by these two adventurous machines, but in the end, we must come back to the key question of whether they are better enough to warrant being so different.

Both machines are blessed with fast computing speed from their 80186 processors, high-quality graphics, and high-capacity disk drives. On the other hand, both have limited software availability. Neither machine will accept IBM accesso-

MONROE AND TANDY

ries, so you will have to rely solely on the manufacturer to provide enhancements such as local area networks, hard disks, tape backups, and the like.

The Monroe stands apart in that it costs more, in part because of its many built-in hardware features. Its three operating systems also give you broad options for software formats. If you need the computing speed and Monroe has the software you

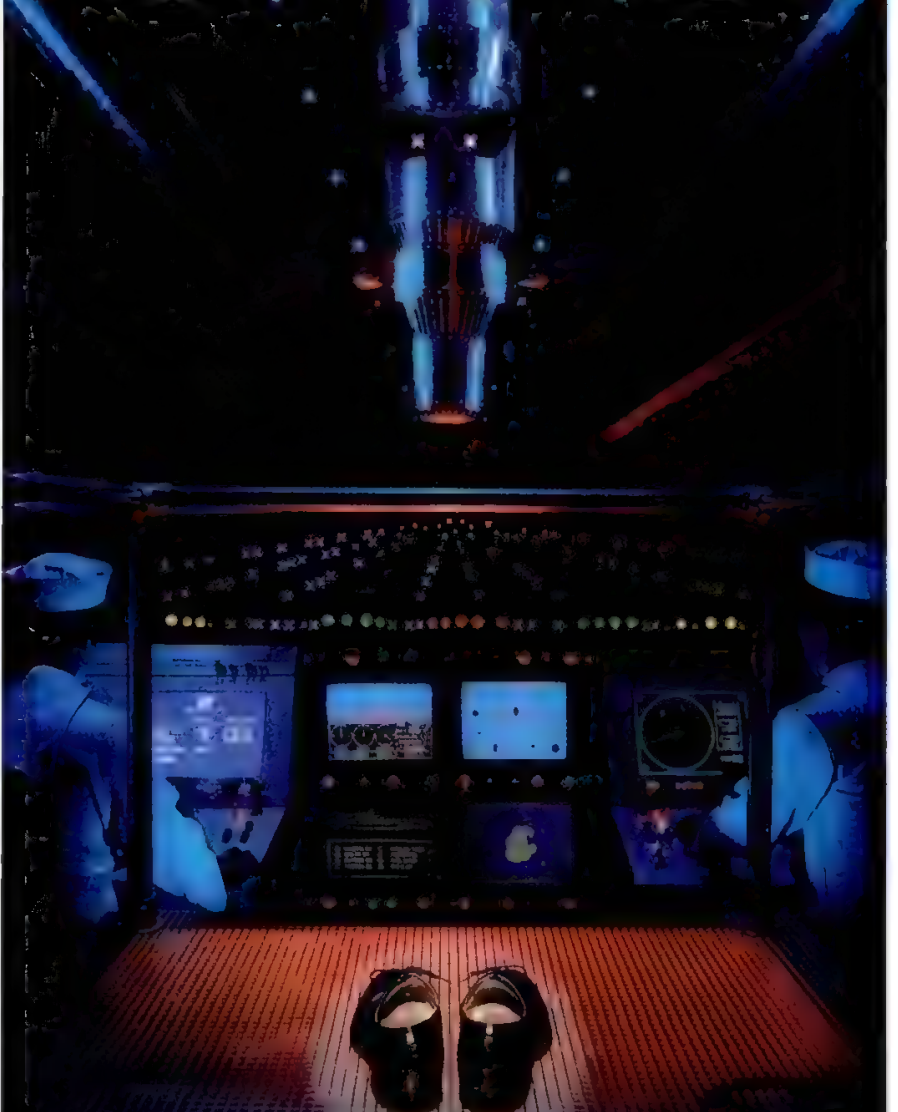
If you need the computing speed and Monroe has the software you need, it is a machine worth considering.

need (or you plan to develop your own), it is a machine worth considering.

The Tandy costs about \$700 less than a comparable Monroe at nearly the same computing speed. Tandy is making an effort to make popular titles available. Its ability to read IBM data disks is a real plus. On the other hand, I found the keyboard cramped and difficult to use; this might be acceptable in a portable, but not in a desktop machine. Given the limited choices available for hardware expansion (only what Tandy will offer), and the fact that there are few discount options available for purchasing Tandy equipment, this machine should be considered only by users certain that they would be satisfied with what they can find in the local Radio Shack Computer Center.

On balance, these two machines present some nice design details and a few quirks. The decision to choose one of them over the PC or its "clones" rests on whether you are willing to trade the availability of "mainstream" software and hardware options for computing speed and disk capacity. For those with specific needs or adventurous spirits, these computers could live long and prosper. ■

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CIRCLE 808 ON READER SERVICE CARD

The PC Masters the Route Between Truck Stops

Routemaster and Truckstops help truck dispatchers increase profitability in business by enabling them to sequence their deliveries more efficiently.

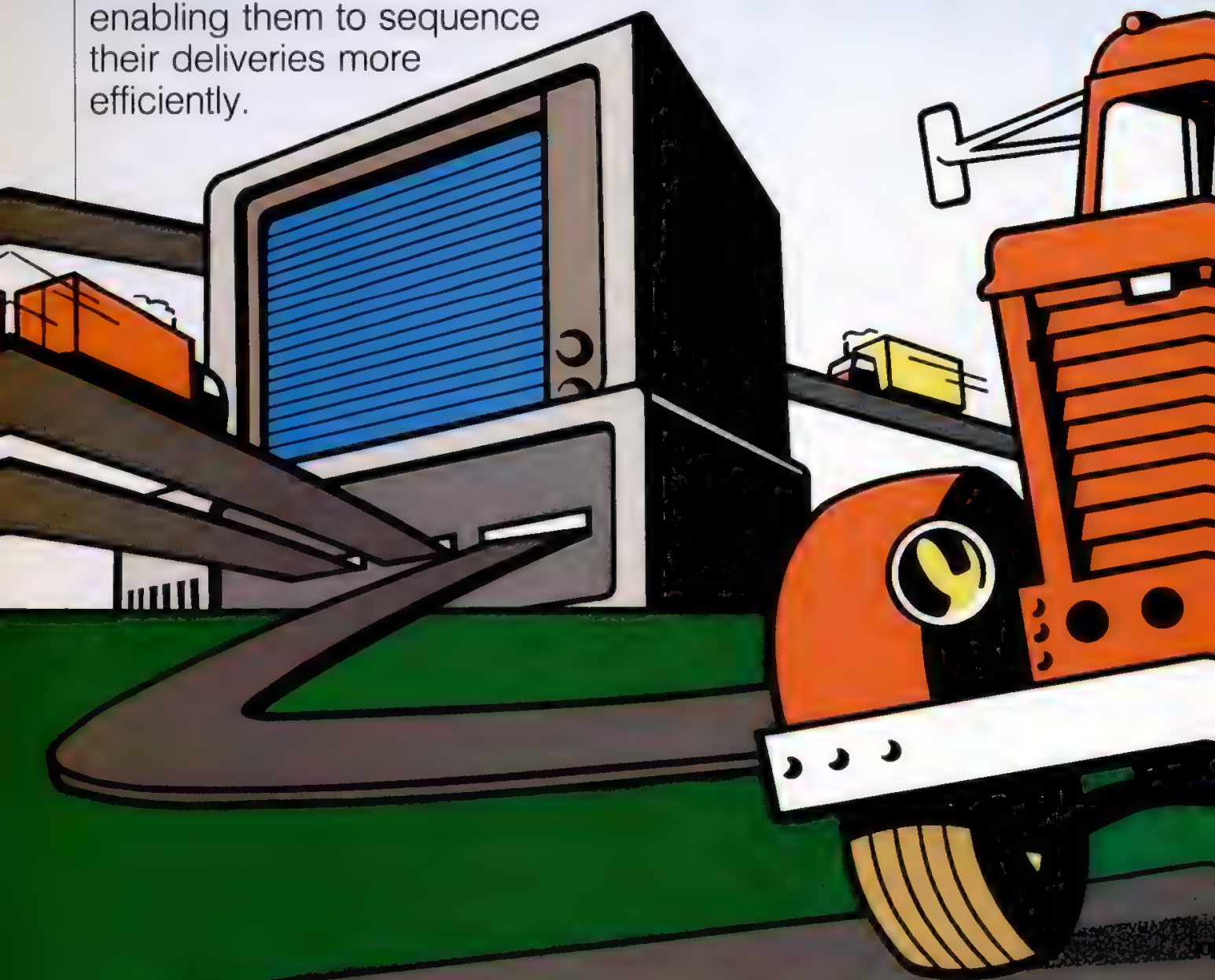




Illustration 1 ou Brooks

TRUCKING

The closer you get, the larger it seems. It's four long steps up to the level of the cab. Inside, the view is excellent to the front, nonexistent to the back. The red plush and black vinyl cab interior is wider than the widest car; your seatmate on the right is more than an arm's length away. The air seat takes your weight with a little give as you settle into it. Put the key into the ignition and turn it. Press the starter and the diesel comes to life. Seven forward gears and two reverse. The clutch and brake are in their accustomed places. You feel like you're going to drive a house, but you're actually in a truck.

Trucks are as integral to our lives in the eighties as trains were in the thirties. Aside from financial investments and real estate, it's likely that you own nothing that wasn't loaded on a truck at some point.

The trucking industry comprises many small operations. In the United States, there are about 17,000 trucking firms and an uncounted number of private truck fleets. The industry employs over 9 million people, more than any other major industry group.

As in other competitive industries, profitability in a trucking business often depends on efficiency. Since the trucks

and the drivers themselves are usually the company's largest single expense, using them efficiently can be critical. Now, two new programs for the PC, *Routemaster* and *Truckstops*, can help truck dispatchers operate their businesses more effectively.

Before you can understand how each program works, you need to understand the dispatcher's job. A truck dispatcher's task begins each day when the company's customers phone in their orders. Materials are picked from stock, and the dispatcher decides which orders to load on which trucks. This apparently simple job requires balancing a number of elements:

- Some trucks are on the road, and some are available. Each is different from the others. A wise dispatcher makes the best possible use of the equipment on hand and plans its availability for several days or weeks ahead.
- Customer orders come in at random. The loads and their destinations are different each day and impossible to predict. Some days five or six orders will fit on one of the smaller trucks; another day two orders might overflow the largest trailer.
- Customers often have special requirements. For instance, many will accept deliveries only at particular times of the day. Some have truck docks and forklifts to speed unloading, while others require unloading by hand from the street.

The dispatcher must plan the shortest possible routes to keep the cost of operating the truck fleet as low as possible. With all the variables to consider, there are millions of alternatives.

Routemaster

In the past, most dispatchers have relied on a map and an intimate knowledge of the routes, customers, trucks, and drivers to sort out their options. But as the cost of computing has steadily declined, managers in many trucking companies have begun to realize that programs like *Routemaster* and *Truckstops* can help even the most experienced dispatcher.

Routemaster is offered by Applied Operations Research, Inc. Its purpose is to

optimize the sequence of stops in a single truck route so the truck covers its route in the shortest time or with the lowest mileage at the least cost. *Routemaster* makes short work of the thorny mathematical problem and presents you with a detailed stop sequence for the route.

The program begins with a user-defined table of the distances between each stop and all other stops. This "distance" can be stated in miles, dollars, or hours. If you like, you can even measure distance in units of beauty and calculate the most scenic way to cover your route. The system provides editing and maintenance routines for the table. Or if you prefer, you can generate the data by using other software and put it on a diskette in *Routemaster's* format.

To begin you are presented with four options: a tutorial, data entry and maintenance, the main routing optimization program, and the system exit to DOS. Pressing a single key moves you to the appropriate program.

If you create your own file of stops outside of *Routemaster's* file-maintenance procedures, you can enter that filename, and *Routemaster* will sequence the stops. Unfortunately, it won't let you list the files on a diskette from within the program. If you forget the filename, you have to stop the program, use the DIR command to list the files, and restart *Routemaster* to run the optimization.

Similarly, it uses stop names in place of stop numbers; you have to remember exactly how all names should be spelled. If you spell a name incorrectly and can't remember the correct spelling, you have to return to the main menu, invoke the editor, and list the stops on the route. You then return to the main menu, re-invoke the optimizer, and start over. Still, some people will prefer names to numbers, even when spelling problems occur. It's a good idea to keep a complete list of your stop names handy.

What's more, you have to know how many stops are represented on the file because *Routemaster* asks you for the



Routemaster

Applied Operations Research, Inc.
22056 Saticoy St.
Canoga Park, CA 91303
(213) 340-1419

List Price: \$195

Requires: 128K RAM, one disk drive.

CIRCLE 761 ON READER SERVICE CARD

Truckstops

MicroAnalytics, Inc.
8409 Hunt Valley Dr.
Vienna, VA 22180
(703) 281-8730

List Price: \$895; demo disk, \$45

Requires: 128K RAM, one disk drive.

CIRCLE 760 ON READER SERVICE CARD



Under certain circumstances, Routemaster can help increase profitability in a trucking operation. But when it comes to more complex operations, MicroAnalytics' Truckstops might do a better job.

number of stops on the route. If you forget, stop and restart again. Familiarity with the system will reduce these problems. Nonetheless they are certainly a nuisance and potentially a colossal waste of time.

When you ask *Routemaster* to sequence the stops on the route, you can specify both the starting and ending points for the route, which can be open or closed, depending on need. Sometimes drivers take their trucks home at night, so the first stop on the route is always the pickup point and the last stop is always home. Other drivers both start and end their routes at one location, driving a complete loop each day.

Routemaster works. It gave me good answers every time and did so reasonably quickly. In one test it calculated a 20-stop route in about 8 minutes. Running times will increase with the number of stops on

the route, so be prepared to wait a bit if you want to optimize 50 stops.

No Human Allowances

But *Routemaster* tackles only part of the real problem. First, it assumes you have assigned each stop to a route, and it optimizes only stop sequences. Second, it ignores payload limitations, which may require that one stop be visited before another so material can be unloaded before making a pickup. And it fails to recognize time of day as a factor. Most businesses accept receipts and make shipments only during specified hours. Human dispatchers routinely make allowances for their customers' schedules, but *Routemaster* assumes all stops can be made at any time of day. These considerations don't rule it out as a worthwhile truck routing tool, but for some cases they do limit its value.

I wish *Routemaster* were a little more

intelligent. If the distance between points A and B were specified in miles and if the distance table included an average speed and an average loading time at each stop, then the program could at least report the arriving and departing times by stop. This relatively simple addition to the program would make it significantly more useful.

Routemaster will be most valuable in cases where routes are not load-sensitive or cube-sensitive (salesmen's routes, and overnight-delivery pickups, for example), where routes are not time-sensitive (no deliveries after 3 p.m.), and in cases where stops are semi-permanently assigned to routes and changed only infrequently.

One final gripe: *Routemaster* won't record solutions on disk, so it is unable to reprint reports. It will present its results on the screen or on both the screen and the printer, but if the printer hangs up and you didn't write down what you saw on the screen, you have no choice but to rerun the entire optimization routine.

Routemaster is written in both compiled BASIC and assembler. It is not copy protected and will run on a hard disk. Its manufacturer, Applied Operations Research, provides unlimited free telephone support with every purchase and will quote modifications to the program based on your specifications.

Truckstops

Under certain circumstances, *Routemaster* can help increase profitability in a trucking operation. But when it comes to more complex operations, *Truckstops*, from MicroAnalytics might do a better job. It's more expensive, more complicated, and harder to use, but it can handle significantly more complex problems.

Truckstops works from three data files, which you can program yourself or create with the system's file editor. One of the three files covers basic system control variables, a second deals with the trucks, and the third, the route stops. *Truckstops* does two things: It designs a route for each truck and then sequences the stops on that

route to minimize the total route cost in terms of mileage, time, and overtime—all subject to constraints.

Truck loading (and therefore route design) is limited by both the number of hours in a day and by the capacity of the trucks. You control these limitations through a series of specific entries and defaults. To begin you create the general parameter file, which establishes a number of policy variables and defaults. You can specify, for instance, the length of the driver's lunch hour and the time of day when it should be taken, the typical work-day length, the permissible amount of overtime, the *x-y* coordinates of both the origin and destination of the routes, and the default truck unloading rate.

Next you must enter each truck into *Truckstops*' truck data file. Each must be defined in terms of capacity, earliest route starting time, latest route completion time, and cost factors for mileage, hours, and overtime hours.

Finally, stops must be recorded. For each stop you must enter the stop name, an *x-y* coordinate, an unloading rate if different from the default, the number of pounds (or cubic feet) to be delivered, and other information.

Part of *Truckstops*' database is a multi-tiered speed zone arrangement used to calculate driving times between stops. The driving time, the load quantity, and the unloading rate for each stop are combined to calculate projected arrival and departure times. These times, of course, must coincide with the hours when the customers will accept shipments. Once the database is complete, you can run *Truckstops*' route design logic, which gives you a choice of two algorithms; one provides a quick-and-dirty solution, but handles large problems and takes relatively little time to finish its work; the other is more precise, but takes longer to run and won't handle large problems. At times these two routines can come up with different answers to the same problem. But, in my tests, the differences were minor.

Both algorithms work in the same gen-

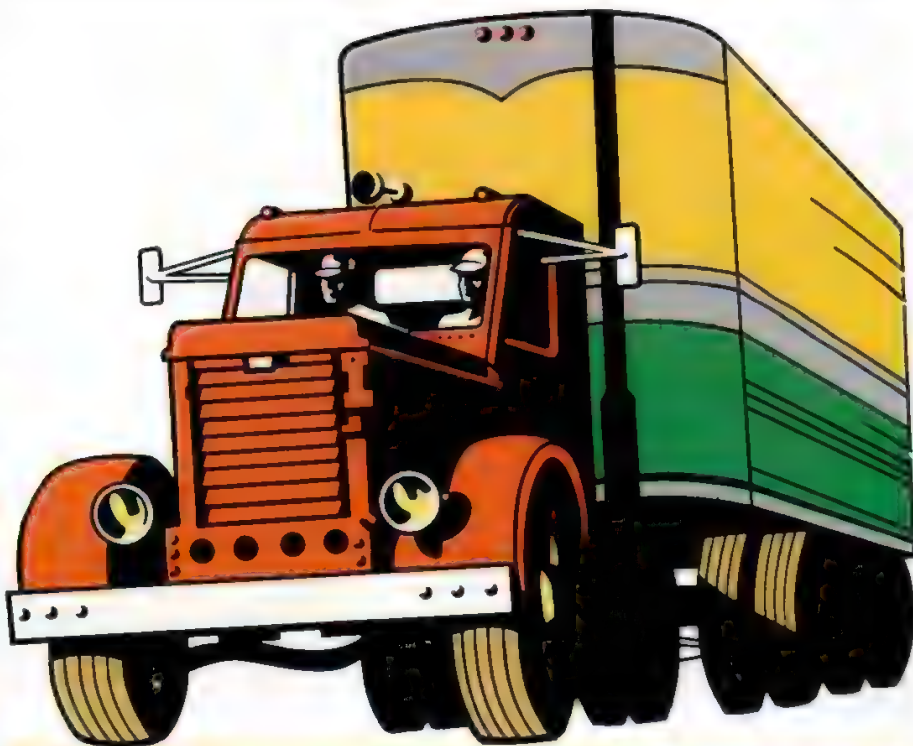
eral way; they consider stops in sequence according to a priority scheme. Each stop is assigned to a route based on such factors as distances to other stops on the route and the available capacity of the truck. The newly added stop is then sequenced with the others to minimize mileage, while still observing timing restrictions at the customer's dock. This method is susceptible to suboptimal solutions because, once assigned to a route, stops are never re-assigned. MicroAnalytics recognizes this, but claims that, in practice, the software produces results that are "good enough." That is, they are consistently better than a

person could achieve with pencil and paper in a reasonable amount of time.

Loading the Final Truck

When *Truckstops* has fully loaded all the available trucks, it quits. Any stops that have not been planned at this point are simply excluded from the day's routes. The program would be improved if it allowed you some measure of control over the sequence in which stops are assigned. That way you could give priority to certain customers.

Truckstops' primary report is a route report, which can be printed or displayed



Truck loading is limited by both the number of hours in a day and by the capacity of the trucks. You control these limitations through a series of specific entries and defaults.

on the screen on a route-by-route basis. It shows customer names and locations, quantities to be delivered, planned delivery times, and distances between stops. Although it does not qualify as either a manifest or as a bill of lading (because it makes no provision for listing the number of containers on the load or their contents), it does provide adequate routing information and serves as route instructions for the driver. Summary versions of this report are available for management.

Nits and Nats

Truckstops was written before the IBM PC was introduced to the market. Although major portions have been rewritten specifically for the PC, at least one awkward legacy remains: hard-coded disk drive defaults. If you have a single-drive system and add a second drive, you'll probably want to change the default to drive B: for the data files. Unfortunately, the change can be made only by MicroAnalytics. The company will do it free of charge, but it is a nuisance.

I found *Truckstops* to be nearly flawless in operation, though not without a few minor annoyances. First, menus are inconsistent. For instance, in the editing routine for the general parameter file, the file is displayed. If you want to change a value, you must place the cursor over that value, type M for modify, enter the new value, and press Return. But, when you are editing the stop file, *Truckstops* wants you to press R for re-enter and then move one at a time through the values. For each value, the editor allows you to press Return to retain the existing value or to re-enter the value. While this inconsistency may seem unimportant, it is an impediment to learning the system.

I also noted a few minor errors in the screen displays. *Truckstops* includes a routine that is intended for simple and fast re-entry of the customer's delivery quantities. For instance, I entered a quantity of 1000 and later changed it to 100. The program accepted the change but forgot to print blank characters after the new value.

This left the last zero from the old 1,000 on the screen and made the new 100 look like the old 1,000. In another instance, a screen failed to clear correctly.

MicroAnalytics says that an entirely new editor is in the works and will be standard on the system by late summer. You should ask about it if you're interested in buying *Truckstops*.

Another irritation: *Truckstops* consists of eight programs, each of which displays the copyright notice and waits for a key-stroke before proceeding. This happens every time a program is started, even if the program has been called from another program. More important than the extra key-stroke is that the user's concentration is broken. Indeed, this is trivial in light of the overall value of the system, but it is just plain silly to display the copyright notice more than once.

Truckstops arrives on three disks. One is a 128K version of the system, the second is an "expanded RAM" version, and the third contains the source code, excluding MicroAnalytics' proprietary computation algorithms. Since BASIC source code is provided, you can modify the system—or contract with a programming house to modify it—so inputs can come from an existing order entry system and outputs can be passed to a distribution/warehousing system. Or, you could modify the existing reports or add new ones. Inclusion of the source code makes *Truckstops* a more powerful and effective tool than it would otherwise be. The code itself appears well done. Routines are clearly labeled, and statements are properly indented for legibility. All in all, the programs are readable and understandable. Anyone with some BASIC experience and with a copy of IBM's BASIC manual should have no trouble with them. My only criticism is the extensive use of single-letter variable names. For instance, the variable Q\$ is harder to understand than one called STOPNAME\$.

MicroAnalytics offers a wide menu of custom modifications. A few, such as resetting the default disk drives and redi-

menting arrays, are offered at no charge. For others, including reformatting screen displays, enhancing *Truckstops* to handle backhauls, and other special requirements, MicroAnalytics will provide quotations on request.

Anyone with some BASIC experience and with a copy of IBM's BASIC manual should have no trouble reading *Truckstops*' code.

You can purchase 8087 support for *Truckstops* at an extra cost of \$245, assuming you have already installed the 8087 math chip in your PC. According to MicroAnalytics, this support will reduce processing time by 40 to 60 percent. I advise trying the system without the 8087 first. My test problems were small, and the system was respectably fast.

Other options are standard and pre-priced. I did not test any of these, but they sound useful. These include multiple load constraints, which permit simultaneous loading to both weight and cubic space limits (\$150), multiple time constraints, which can limit both driving and total working time (\$150), and the handling of physical "barriers" such as a lake or mountain (\$250).

Still other features can be added on a custom basis: input from a distance file, rather than from x-y coordinates stored in the customer/stop file, load-splitting, multiple-day routes, and city and town location databases. MicroAnalytics will quote these features on request.

Truckstops is not copy protected and will run from a hard disk. The manufacturer provides unlimited free telephone assistance with the system purchase. A tutorial and demonstration diskette is available separately. ■



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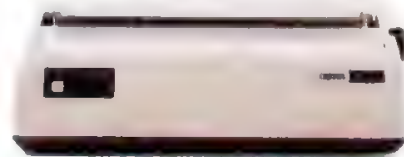
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CIRCLE 285 ON READER SERVICE CARD

Adapting Your Display for Speedy Updates

The FULSCRN program allows your BASIC programs to update the screen in a twinkling, the way commercial applications do, and without creating "lightning" on your monitor.

Editor's note: Recently, manufacturers have announced several new computers with impressive graphics capabilities. This development has caused much concern among PC owners, who are accustomed to the seemingly sluggish displays that BASIC programs provide.

While the PC was not specifically designed as a graphics machine, and while its several-years-old electronics are not a match for some of the newer models on the market, the PC is capable of far faster displays than most BASIC programmers can imagine.

One of the complaints we hear most often from readers is that BASIC is distractingly slow and that they end up with "lightning" or "confetti" on the screen if they try manipulating images directly in the PC's single-ported color graphics memory.

In the following article, programming wizard David McManigal shows how to coax dizzying speeds out of your PC, from within BASIC and without "lightning," with results that are simply astonishing. You won't believe your screen.

Many commercial software programs can update the PC's display screen in the blink of an eye. They spoil you for standard application interfaces such as BASIC. "Where did the speed go?" you wonder. Obvious-

ly, it's lost somewhere in the programming hinterland between the standard interfaces and the display adapter.

The display adapter is really a computer within a computer. It executes general-purpose programs slowly but can run tai-

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SPEEDY UPDATES

lored programs quite rapidly. Naturally, it would be nice to improve its speed for your own programs. Unfortunately, the complex appearance of a display adapter can make the needed tailoring seem intimidating. Moreover, not everyone is comfortable programming in assembly language, which you need to work effectively with a display adapter. I have drawn a road map for those who would like to try this path to improving their PC's performance without at the same time becoming computer professionals.

Display Adapter Fundamentals

Figure 1 illustrates the general structure of a display adapter. The IBM Monochrome Display Adaptor, the IBM Color Graphics Adaptor and compatible display adapters are all built around the Motorola 6845 display controller chip. The 6845 is a

A computer within a computer, the display adapter executes general-purpose programs slowly but can run tailored programs quite rapidly.

highly specialized and powerful microprocessor resembling the Intel 8088, the CPU used in the PC.

The internal registers of the display controller hold parameters that define the display format—number of lines, number of characters per line, synchronization (sync) signal position and width, raster configuration, and so forth. You access these registers by writing the register number to port address 3B4H (for monochrome) or 3D4H (for color), then writing or reading the associated data value at port address 3B5H (for monochrome) or 3D5H (for color).

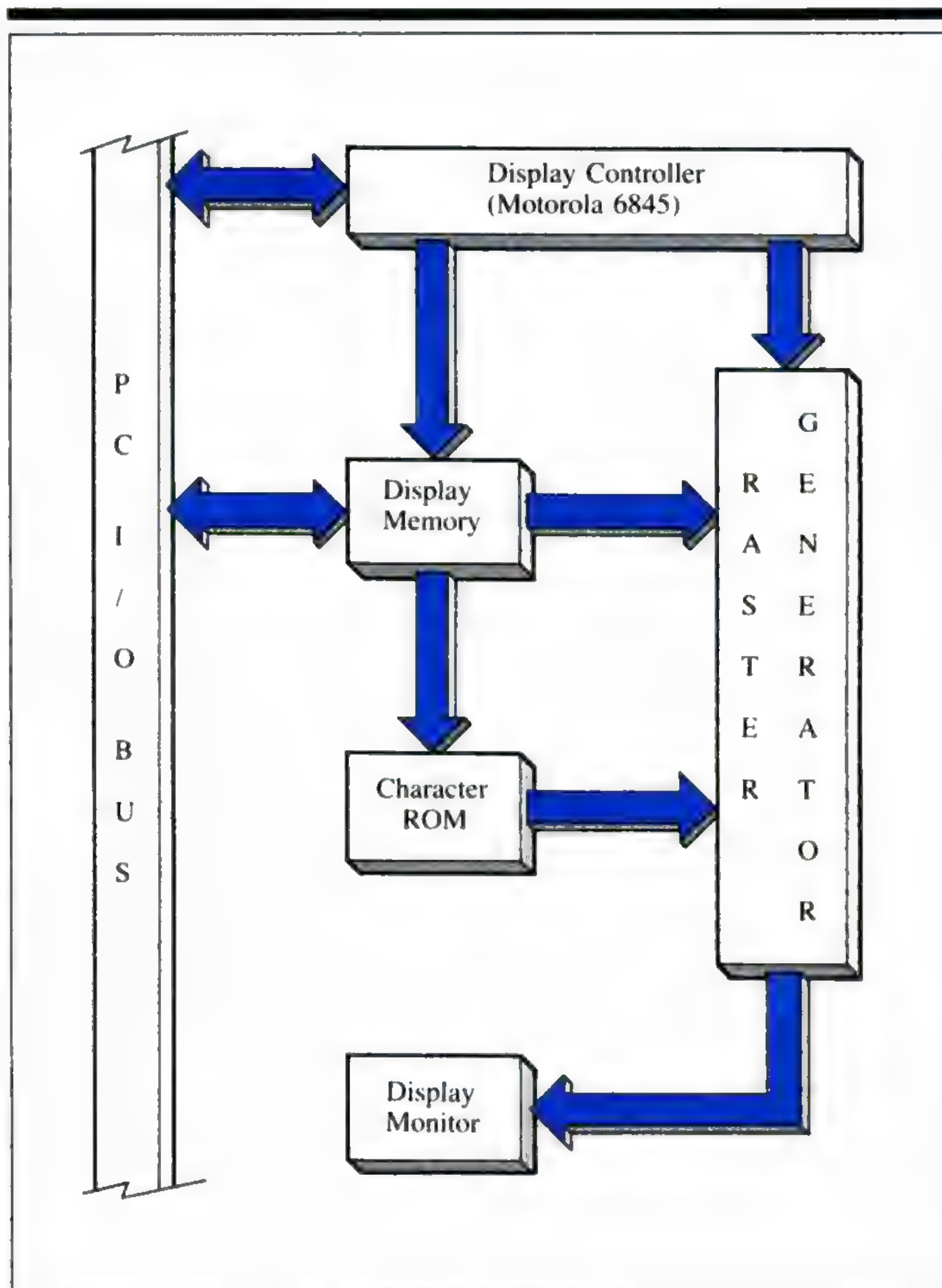


Figure 1: General structure of a display adapter.

Display adapters include other registers that contain the monitor mode (port 3B8H for monochrome, 3D8H for color) and monitor status (port 3BAH for monochrome, 3DAH for color). In addition, the color/graphics adapter has a color selection register at port address 3D9H.

A second key component of any display adapter is memory—4K bytes for the monochrome adapter or 16K bytes for the

color adapter. Higher-resolution adapters incorporate 32K bytes or more of display memory.

Although display memory is separate from other PC memory, the system accesses it exactly as if it were a part of the main memory. The monochrome adapter uses memory addresses B0000-B0FFF hex and the color/graphics adapter uses memory addresses B8000-BBFFF hex.

SPEEDY UPDATES

Since the PC uses different memory and I/O port addresses for the monochrome and color adapters, they can coexist in a single system.

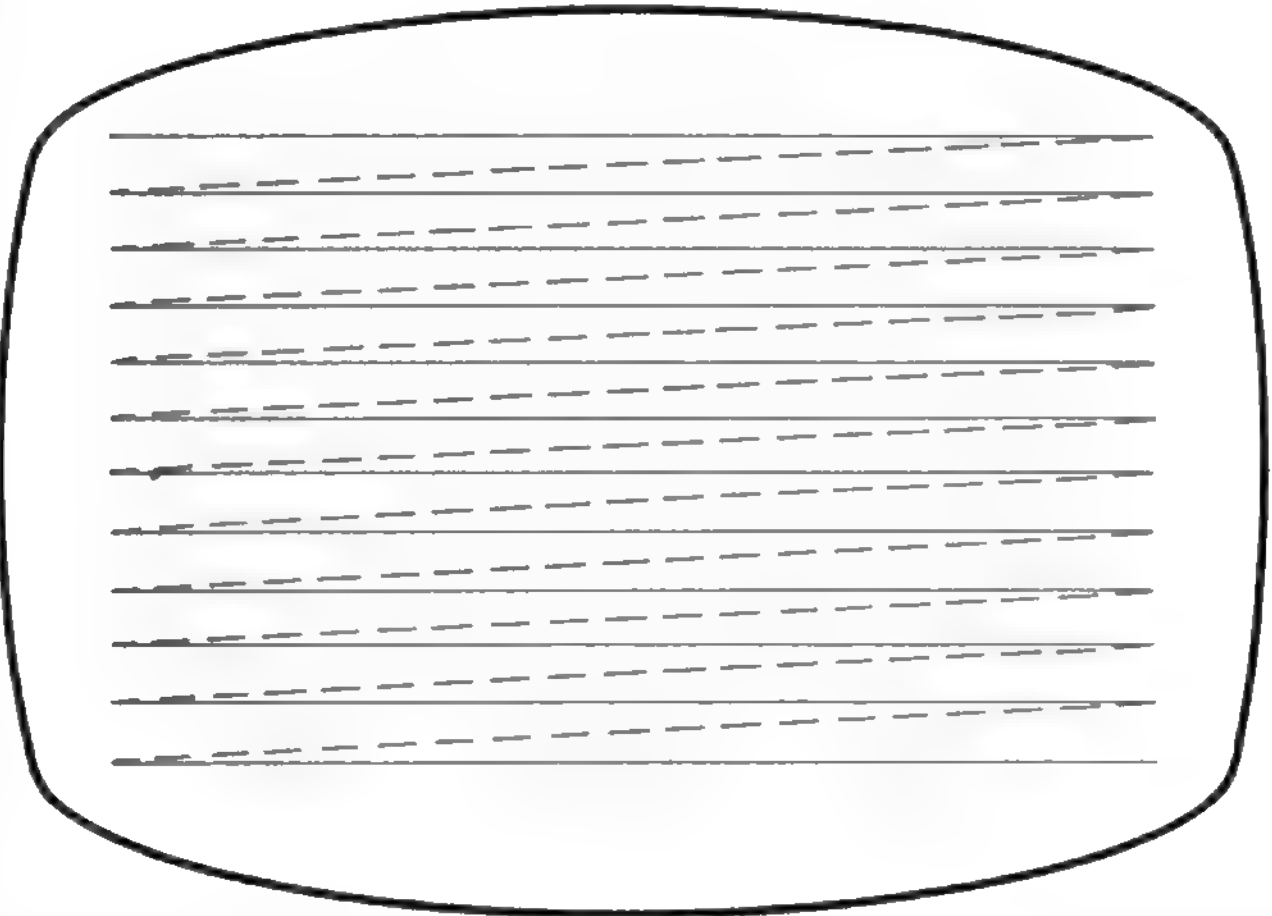
A third major component of a display adapter is the raster generator, which produces the video and synchronous signals needed to drive a display monitor or a TV set. The monochrome adapter produces two video signals (video and highlight) that turn the display beam off, partly on, or fully on at the appropriate time. The color/graphics adapter produces four video signals: red, green, blue, and

Although display memory is separate from other PC memory, the system accesses it exactly as if it were a part of the main memory.

“intensify.” The vertical and horizontal synchronous signals that the display controller originates are simply passed on to the IBM Monochrome Monitor or an RGB monitor, but they are combined with the video signals to drive a composite monitor or television set.

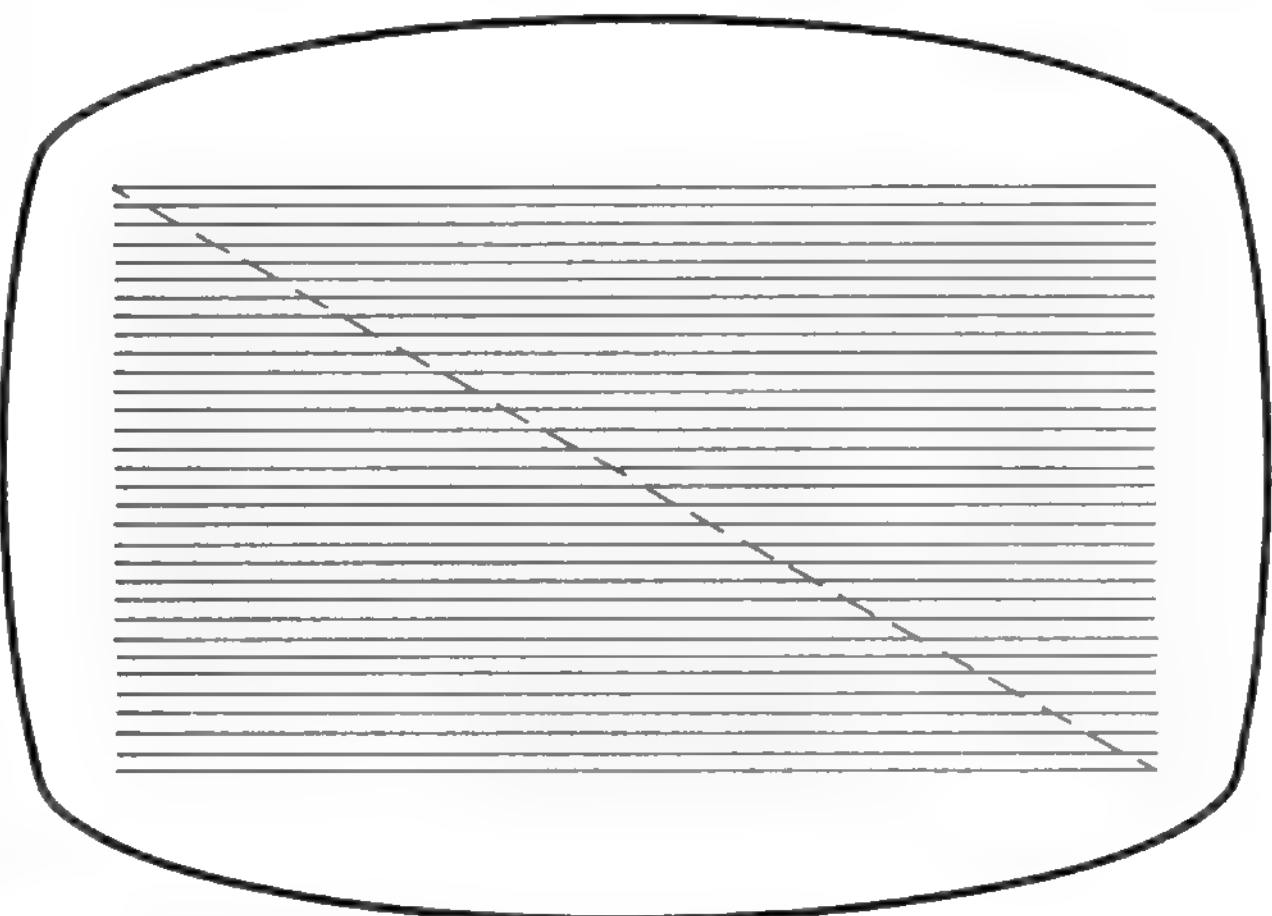
A display adapter’s fourth key component is a read-only memory (ROM) that stores a pattern of dots to represent each displayable ASCII character code. The display controller includes counters that keep track of the character column and row, as well as the scan line within each character. The character ROM stores dots for each scan line of a character as a binary word that turns the display beam on and off, thereby producing the character representation. In graphics modes, display memory contents travel directly to the raster generator, bypassing the character ROM. All characters displayed in graphics modes are converted into the appropriate dot patterns by the operating system

HORIZONTAL RETRACE 12 microseconds



Dotted line represents path of beam during horizontal retrace.

VERTICAL RETRACE 1.2 milliseconds



Dotted line represents path of beam during vertical retrace.

before being stored in display memory.

Lightning Strike

For the programmer, one important, basic difference between the IBM Monochrome Display Adaptor and the IBM Color Graphics Adaptor is that the monochrome adapter's memory allows you to write new data to it without interfering with the read operations of the raster generator, while the color/graphics adapter requires dedicated read access to the display memory while each line is scanned. Writing data to the color monitor's display

Because the adapter uses a 60 frames per second refresh rate, omitting an occasional display frame produces no visual effect. A full-screen update takes less than 1/30 second.

memory during a line scan disrupts the raster generation process, producing short horizontal bars on the screen instead of the intended data pattern. The resulting visual effect resembles that of a lightning strike during a thunderstorm. Unlike a real lightning strike, which can damage the computer, these "lightning strikes" cannot harm your equipment; however, they are quite disconcerting, and therefore undesirable.

You can avoid "lightning strikes" by writing data into the display memory only when the memory is not needed for raster generation. Three programming methods can do this job.

1. You can wait for the horizontal retrace period, when the CRT beam is

TITLE FULSCRN Full Screen Output Subroutine			
PAGE			
CODESEG	SEGMENT	PARA PUBLIC 'CODE'	
	ASSUME	CS:CODESEG,DS:NOTHING,ES:NOTHING	
FULSCRN	PROC	FAR	
	PUSH	BP	; SAVE BP REG
	MOV	BP,SP	; COPY STACK POINTER
	PUSH	ES	; SAVE E-SEG REGISTER
	MOV	BX,0B000H	; MONO CARD BUFFER SEGMENT
	SUB	CX,CX	; INIT COUNT REG
	CLD		; DIRECTION = FORWARD
	MOV	ES,CX	; POINT TO SEGMENT 0
	MOV	DI,ES:[44EH]	; INIT SCREEN BUFFER POINTER
	MOV	AH,25	; INIT LINE COUNT
	MOV	DL,ES:[449H]	; GET DISPLAY MODE BYTE
	SUB	DL,7	; MONOCHROME?
	JZ	MONO	; ...YES
	MOV	BH,0B8H	; COLOR CARD BUFFER SEGMENT
	ADD	DL,3	; GRAPHICS MODE?
	JS	ALPHA	; ...NO
	MOV	AH,200	; INIT GRAPHICS LINE COUNT
ALPHA:	MOV	DX,3DAH	; ADDR OF COLOR CRT STATUS REG
DOWAIT:	IN	AL,DX	; GET CURRENT DISPLAY STATUS
	TEST	AL,8	; VERTICAL RETRACE?
	JZ	DOWAIT	; ...NO (Continues)

Figure 2: Source code for FULSCRN.

turned off while it is deflected rapidly from the end of one scan line to the beginning of the next line. The system signals its horizontal retrace period by setting bit 0 (mask value 01H) of the monitor status register to 1. To make sure the retrace period is not already partially used up, you should first wait for this bit to change to 0, then wait for it to change to 1. You may then write a display memory byte without creating "lightning." A full-screen data update takes at least 1/8 second using this method. Updating both data and display attributes of a full screen takes at least 1/4 second. The standard programming inter-

faces, which also use this technique, require as much as 3 seconds to update the full screen because of other programming overhead.

2. You can wait for the vertical retrace period, when the CRT beam is turned off while it is deflected from the bottom of the screen to the top of the screen between successive display frames. The system signals vertical retrace by setting bit 3 (mask value 08H) of the monitor status register to 1. You should again first wait for the 0 to change to 1. You can then write about 240 bytes without producing "lightning." A full-screen update takes

SPEEDY UPDATES

```

MOV     DX,3D8H      ; ADDR OF COLOR CRT MODE REG
MOV     AL,ES:[465H]  ; CURRENT DISPLAY STATUS VALUE
AND     AL,0F7H      ; DELETE VIDEO ENABLE BIT
OUT     DX,AL        ; DISABLE VIDEO (BLANK SCREEN)
MONO:   MOV     ES,BX  ; SET DISPLAY BUFFER SEGMENT
        MOV     BX,[BP]+6 ; ADDRESS OF SCRNI(1)
LOOP:   MOV     CL,[BX]  ; STRING LENGTH
        MOV     SI,[BX+1] ; STRING OFFSET
        SHR     CL,1     ; HALVE BYTE COUNT
        JZ      NULL    ; IGNORE LENGTHS < 2
        REP     MOVSW    ; MOVE STRING TO DISPLAY BUFFER
NULL:   ADD     BX,3     ; STEP STRING INDEX
        DEC     AH      ; COUNT DISPLAY LINES
        JNZ     LOOP    ; ...AND LOOP
        OR      DL,DL   ; MONO?
        JZ      DONE    ; ...YES
        MOV     DL,0D8H ; ADDRESS OF COLOR CRT MODE REG
        OR      AL,8    ; SET VIDEO ENABLE BIT
        OUT     DX,AL   ; ENABLE VIDEO (UNBLANK SCREEN)
DONE:   POP     ES      ; RESTORE REGS FOR RETURN
        POP     BP
        RET     2       ; RETURN TO BASIC
FULSCRN ENDP
CODESEG ENDS
END

```

Figure 2: Source Code for FULSCRN continued.

just over 1/3 second using this method.

3. You can wait for the vertical retrace period and then disable the CRT beam for a full frame period by setting the monitor mode register bit 3 (mask value 08H) to zero. You can then update the full screen before re-enabling the CRT beam. Because the color/graphics adapter uses a 60 frames per second refresh rate, omitting an occasional display frame produces no noticeable visual effect. With this method, a full-screen update will take less than 1/30 second.

You might conclude from this description that the third method is the best

because it permits the fastest full-screen update. However, at times you might want to update only a few bytes of the display memory. The first method allows you to do it in a few display line periods, at 63.5 microseconds each, while the third method could take as many as 200 line periods to update a single byte. The third method is definitely the best for updating about 200 bytes or more. The second method is never optimal.

Another reason for preferring the first method in some cases is that the other methods require that all the new display data reside in a single, contiguous area of

main memory before they are transferred to display memory. Method 1, although slower for voluminous output, allows you to write discontinuous bytes or strings efficiently.

These considerations only apply to the IBM Color/Graphics Adaptor. You can update the memory of most other adapters at any time without such special timing.

Display Adapter Programming

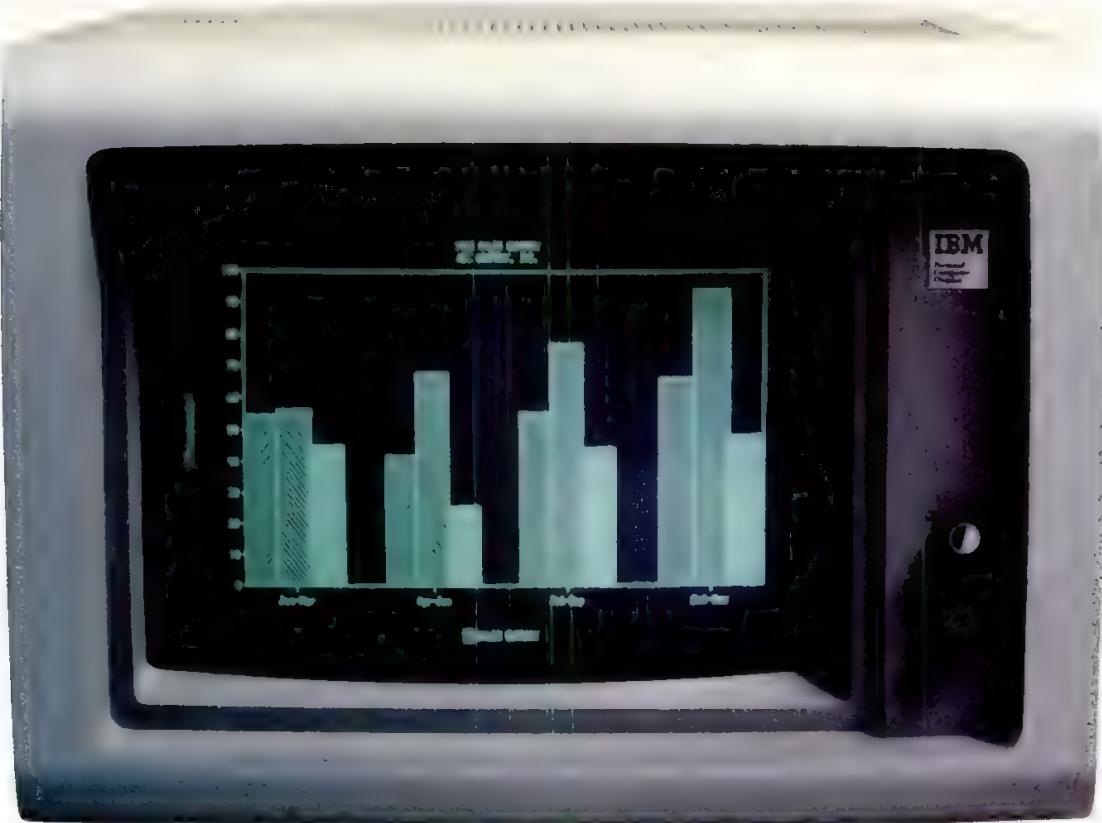
In the monochrome and color/graphics adapter character modes, each display position comprises a data byte followed by

You can modify FULSCRN to update selected portions of the screen. But this would tend to degrade the speed advantage that is the principle reason for using FULSCRN.

an attribute byte. To rapidly update the display, using the monochrome adapter is quite simple: just move the new data directly to the display buffer. The color adapter, as I have described, needs synchronization code to avoid "lightning strikes."

Figure 2 is the assembler language source code for FULSCRN, a subroutine that can be called from a BASIC program to display a full screen of data and attributes in one refresh cycle. Figure 3 shows how FULSCRN can be used in a BASIC program. FULSCRN.BAS will construct and display 26 different screens of data at a rate that may surprise you.

Statements 30 to 170 in Figure 3 define FULSCRN. You can include these state-

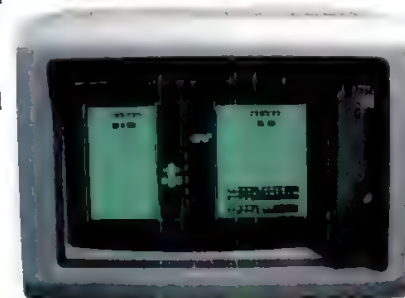


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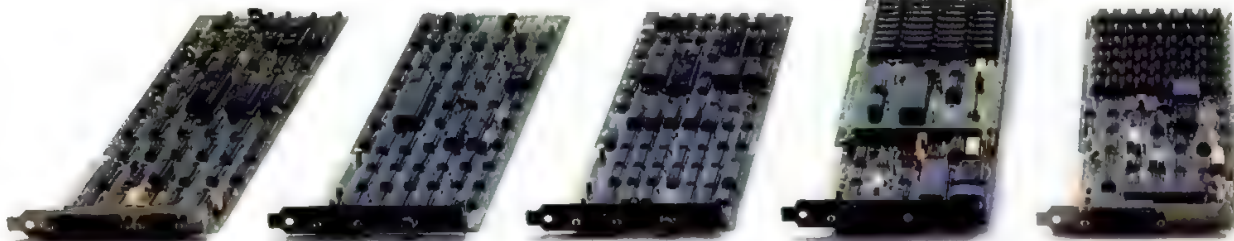
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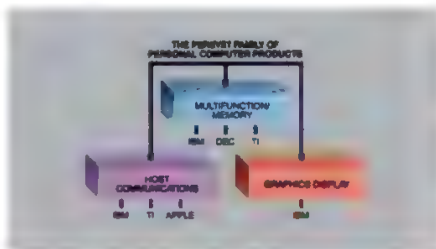


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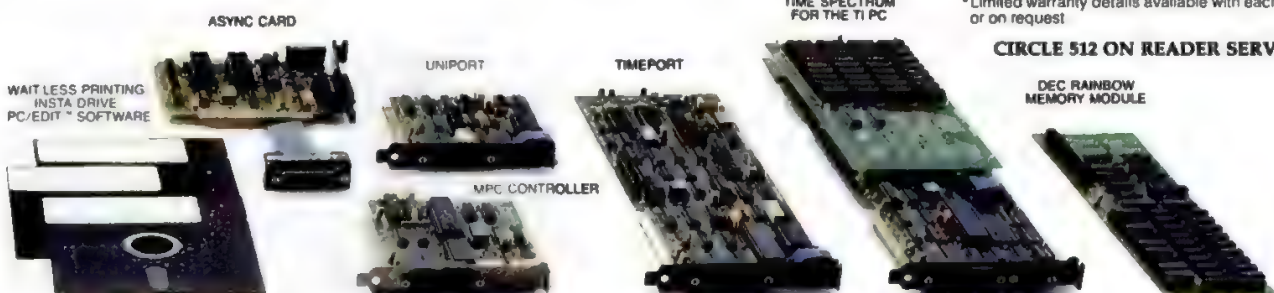


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SPEEDY UPDATES

ments (with appropriate line numbers, of course) in any BASIC program in which you wish to use FULSCRN. Each string in SCRN\$ (or whatever you choose to call the screen image array) represents one display line, including display attributes. Conventional BASIC programming techniques will permit you to update array SCRN\$ quite easily. Then, you can redisplay the entire screen with a single call to FULSCRN.

You should bear in mind that FULSCRN will override any prior PRINT statements each time it is called. Of course, you could modify FULSCRN to

By reading PC manuals and other literature and then experimenting with PC functions, any reader should be able to come up with new techniques for using the PC more effectively.

update selected portions of the screen, leaving undisturbed other portions for use with PRINT statements. But this change would tend to degrade the speed advantage that is the principal reason for using FULSCRN in the first place.

FULSCRN is most useful for the color adapter because it speeds screen updates without creating "lightning strikes." However, it is also useful for the monochrome adapter, because an assembler language string move operation is much faster than a BASIC POKE loop, even in compiled BASIC. Because FULSCRN determines which monitor is currently active, and in which mode, it permits considerable application flexibility. It can

```
10 REM          First, define FULSCRN
20 REM
30 DIM CODEX(47): AX=0: IX=0: JX=0
40 DEF SEG: AX=VARPTR(CODEX(1))
50 FOR IX=1 TO 93: READ JX: POKE AX,JX: AX=AX+1: NEXT IX
60 DATA &H55,&H8B,&HEC,&H06,&HBB,&H00,&HB0,&H2B
70 DATA &HC9,&HFC,&H8E,&HC1,&H26,&H8B,&H3E,&H4E
80 DATA &H04,&HB4,&H19,&H26,&H8A,&H16,&H49,&H04
90 DATA &H80,&HEA,&H07,&H74,&H1B,&HB7,&HB8,&H80
100 DATA &HC2,&H03,&H78,&H02,&HB4,&HC8,&HBA,&HDA
110 DATA &H03,&HEC,&HA8,&H08,&H74,&HFB,&HBA,&HD8
120 DATA &H03,&H26,&HA0,&H65,&H04,&H24,&HF7,&HEE
130 DATA &H8E,&HC3,&H8B,&H5E,&H06,&H8A,&HOF,&H8B
140 DATA &H77,&H01,&HDO,&HE9,&H74,&H02,&HF3,&HA5
150 DATA &H83,&HC3,&H03,&HFE,&HCC,&H75,&HEE,&H0A
160 DATA &HD2,&H74,&H05,&HB2,&HD8,&HOC,&H08,&HEE
170 DATA &H07,&H5D,&HCA,&H02,&H00
180 REM
190 REM Now, set up data and screen parameters.
200 REM 80-column alphanumeric mode is used.
```

(Continued)

Figure 3: A sample program using FULSCRN in BASIC.

serve as a model of direct screen update techniques for those who want to develop a more powerful screen manager.

Graphics Techniques

You can use FULSCRN in graphics modes by changing the dimension of the SCRN\$ array to 200 and putting the appropriate graphics data in it. In graphics modes, the display memory is divided into two halves. The half with the lower addresses supplies data for even-numbered scan lines (0,2,4 . . . 198), while the upper half supplies data for odd-numbered lines (1,3,5 . . . 199). Each 80-byte string in the SCRN\$ array represents one display line. SCRN\$(1) thus represents the top line, while SCRN\$(101) represents the second line, and so forth.

In high-resolution graphics mode, each

byte of the SCRN\$ array represents 8 bits of graphic data. The high-order bit of each byte represents the leftmost of a group of eight dots on the screen. Because there is only one bit of data per displayed dot, each dot can only be on or off. The off color is black, but you may select the on color by placing a 4-bit value in the background color register at port address 3D9H. The normal 16 foreground/background color values will produce the usual colors when used in this way.

In medium-resolution color mode, each display dot is represented by 2 bits in the SCRN\$ array, the leftmost dot corresponding to the high-order bits of each byte. Each 2-bit couple identifies one of four colors of the current palette.

The PC offers two standard palettes: black, cyan, magenta, and white, and

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SPEEDY UPDATES

```

210 REM L$(N) is a line of data comprising the
220 REM Nth letter of the alphabet and attributes
230 REM for white characters on a black background.
240 REM
250 SCREEN 0,0,0: DIM L$(27), SCRN$(25)
260 ALPH$="ABCDEFGHIJKLMNOPQRSTUVWXYZ "
270 FOR JZ=1 TO 27: A$=MID$(ALPH$,JZ,1)+CHR$(7)
280 FOR IZ=1 TO 6: A$=A$+A$: NEXT IZ
290 A$=LEFT$(A$,80): L$(JZ)=A$+A$: NEXT JZ
300 REM
310 REM Generate and display screens of data.
320 REM Each screen is 25 lines of data from L$.
330 REM Each string in SCRN$ must be initialized
340 REM to 160 bytes so that LSET can be used to
350 REM fill it very rapidly. Using LSET also
360 REM avoids BASIC garbage collection delays.
370 REM
380 FOR IZ=1 TO 25: SCRN$(IZ)=L$(1): NEXT IZ
390 FULSCRNZ=VARPTR(CODE$(1)): FOR JZ=1 TO 27
400 FOR IZ=1 TO 25: LSET SCRN$(IZ)=L$(JZ)

```

Figure 3: A sample program using *FULSCRN* in BASIC continued.

black, green, red, and brown. If you use an RGB (direct drive) monitor, a third palette is available, although it is not described in the manuals. By setting bit 2 of the mode register to 1, you can override the normal palette selection to obtain black, cyan, red, and white. You may include the statement `OUT &H3D8,14` in a BASIC program to activate palette 3, and the statement `OUT &H3D8,10` to revert to the standard palette that was active before you switched to palette 3.

Discovery Unlimited

You can do much more with your display adapter than I can squeeze into one article. For example, a currently available communication package uses the color adapter to display 31 lines of 64 or more proportionally spaced alphanumeric char-

acters. It reduces the vertical frame rate to 57 Hz to compensate for the increased data capacity, and you must adjust the monitor's vertical size control to allow for the larger frame, but the visual result is quite excellent. In fact, the display screen looks quite unlike what you are accustomed to seeing on an IBM PC. Of course, a complete display support package must be included in the program, along with a substitute for the character ROM, so the programming requirements are quite substantial. But it can be done!

By reading PC manuals and other literature and then experimenting with PC functions, any reader with a bit of curiosity and some time to explore should be able to come up with new techniques for using the PC more effectively. I've only scratched the surface here. ■

A Tale of Two Modems

Although the evolution of micro communications may render separately marketed modems obsolete, for now, the POPCOM X100 and the PC:Intellimodem represent the state of the art.

Bizcomp and POPCOM are two names with about as much high-tech zing as you can put into the name of a computer-communications product. The names convey the flashy and easy-to-use image that the companies marketing these products are trying to project. Bizcomp is short for Business Computer Corporation. The latest product from this company is called the PC:IntelliModem. The POPCOM X100 is a new modem developed and marketed by a company with a long history in the modem business, Prentice Corporation.

Both Prentice's POPCOM X100 and the Bizcomp PC:IntelliModem are audio modems designed for use over ordinary telephone systems. They convert the relatively weak direct-current signals inside your PC into tones that can pass over the standard dial telephone lines. That func-

tion is technically simple; recognizable modems have been commercially available since the 1950s. To understand how these modems work, you first need to understand how modems have evolved since then.

In the 1970s, changes in FCC regulations joined with technological developments to make possible the introduction of direct-connection modems, which connect to the telephone line electrically. These replaced acoustical couplers, which exchanged audio tones with the handset of the telephone. In 1977, Dennis Hayes significantly advanced the state of the art in data communications by introducing the Hayes Micromodem. One model, the Micromodem 100, fits into the expansion slots of S-100 bus computers, and the Micromodem II fits into a slot in the Apple II. These internally mounted modems

could dial the telephone line on command from the computer and answer a ringing telephone line under computer control. The internal mounting feature eliminated the need for an RS-232C serial communications board in the computer, but it created the need for special software capable of controlling the modem by sending signals to it through the system bus.

In 1981, Hayes Microcomputer Products again set the standard in modems with the introduction of the Hayes Stack Smartmodem. The Smartmodem is an external modem that connects to the serial port of the computer through an RS-232C cable. But this modem contains a small microprocessor and a stored program that allow it to monitor the data coming from the computer and watch for special codes telling it to dial a number, answer the ringing phone line, hang up, and perform other

TWO MODEMS



The POPCOM modem comes in both internally mounted and standalone versions. The external version pictured here can be hidden away under a desk or in a power strip. Note the rotating AC power connector.

setup and maintenance functions. The software designed for this modem can be very simple since it only has to send standard characters out of the serial port.

The Hayes Stack Smartmodem has become popular, and the Smartmodem operational commands are now used by a wide variety of modems. In 1983, Hayes introduced the Smartmodem 1200B, which is an internally mounted version of the Smartmodem 1200 for the IBM PC. This internal device operates identically to the standalone Smartmodem, but it occupies an expansion slot instead of being



POPCOM X100

Prentice Corporation
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Sunnyvale, CA 94088
(408) 734-9855

List Price: \$475 for standalone unit;
\$495 for C100 internally mounted
unit.

Requires: X100 requires RS-232C port;
C100 requires PC bus slot.

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and 300 baud. Auto-dial, auto-answer,
voice/data switching.

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connected through a serial port and cable.

Both the POPCOM and Bizcomp modems reviewed here perform essentially the same functions as the Hayes Smartmodem. They contain microprocessors and control programs, dial the phone in response to commands from the computer, and answer the ringing telephone line under control of the computer. With the proper software, both modems can operate unattended. The POPCOM X100 is designed to be permanently plugged into the electrical socket, the telephone line, and the computer. (A recently announced POPCOM C100, which I did not test, is mounted on a circuit board that fits into one of the expansion slots in the PC.) The Bizcomp PC:IntelliModem is mounted internally in the computer and has connections to the telephone system.

So far, all the capabilities described could be found in any of several modems from VenTel, Novation, or Hayes. Familiarity with a typical data communications session between two people using microcomputers and standard modems will help you understand what make the POPCOM X100 and the PC:IntelliModem special.

Assume that I wanted to send a file containing the text of an article to *PC Magazine*. Even with prior arrangements, I would probably first call an editor on PC's technical staff and talk to him by voice to ensure that his PC was ready to accept data. We would talk about the size of the file, the protocol the communications pro-

grams use, and what he will do with the data diskette when the transfer is completed. After this discussion, I would hang up and dial into PC's system. If there were any problem during the transfer (say the data diskette fills up with my endless prose), I would have to terminate the data call, hang up, and call back on the voice number. All of this dialing and redialing is time consuming and expensive. The POPCOM and Bizcomp modems allow you to switch between voice and data calls without hanging up and redialing—if you have one of these modems at both ends of the circuit. This voice/data feature is an incremental gain in the state of the art for modems. Of course, a closer look at the POPCOM and Bizcomp modems will expose differences between them, too.

POPCOM X100

The housing of the POPCOM X100 modem is streamlined and functional. A rotating AC plug connection allows the modem to be plugged into the wall or into an extension cord or power strip. Cables for the telephone line and telephone plug into the bottom of the device. The small knob to control the volume of the internal speaker is the only physical control on the POPCOM X100; it has no lights to watch or switches to set. The device draws very little power from the wall socket and is always ready to go to work. The modem plays a little tune to signal that it is happy with the connections that have been made. It plays a tune for each connection and three tunes in a row to indicate good power, telephone, and computer connections. As an operational status message, the tune is pretty easy to interpret. (The internally mounted POPCOM C100 fits into an expansion slot and takes its power from the computer, but it operates in exactly the same way as the standalone version.)

The POPCOM operates in several modes. If you want it to emulate a Hayes Smartmodem, send it a single setup command and it will act as a Smartmodem until it is reset. If you want even more control and flexibility, select the POP-

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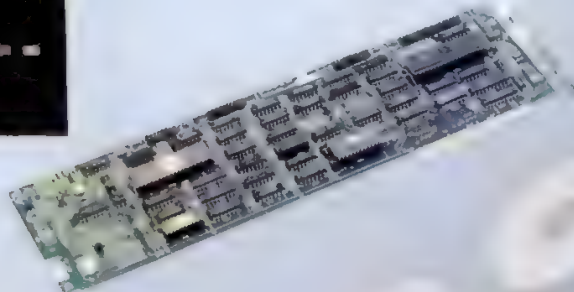
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Features	Tele-PC	IBM PC	Tele-XT	IBM XT
Monitor	YES	OPTIONAL	YES	OPTIONAL
Screen Size	14"	12"	14"	12"
Tilt Screen	YES	NO	YES	NO
Quiet Operation	YES (NO FAN)	NO	YES	NO
Memory	128K	128K OPTION	256K	256K OPTION
Graphics Display (640 x 200 resolution)	YES	OPTIONAL	YES	OPTIONAL
Printer Port	YES	OPTIONAL	YES	OPTIONAL
Communications Port	YES	OPTIONAL	YES	YES
MS™DOS/BASIC®	YES	OPTIONAL	YES	OPTIONAL
System Expansion Slot	YES	YES	YES	YES
RGB and Video Port	YES	OPTIONAL	YES	OPTIONAL

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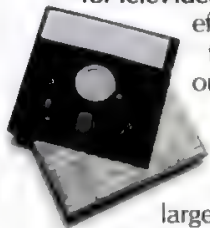
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Quiet Operation	YES (NO FAN)	NO
Display	YELLOW	AMBER
Memory	256K	256K
Graphics	YES	YES
Communications Port	YES	OPTIONAL
Printer Port	YES	OPTIONAL
MS™DOS 2.11	YES	OPTIONAL

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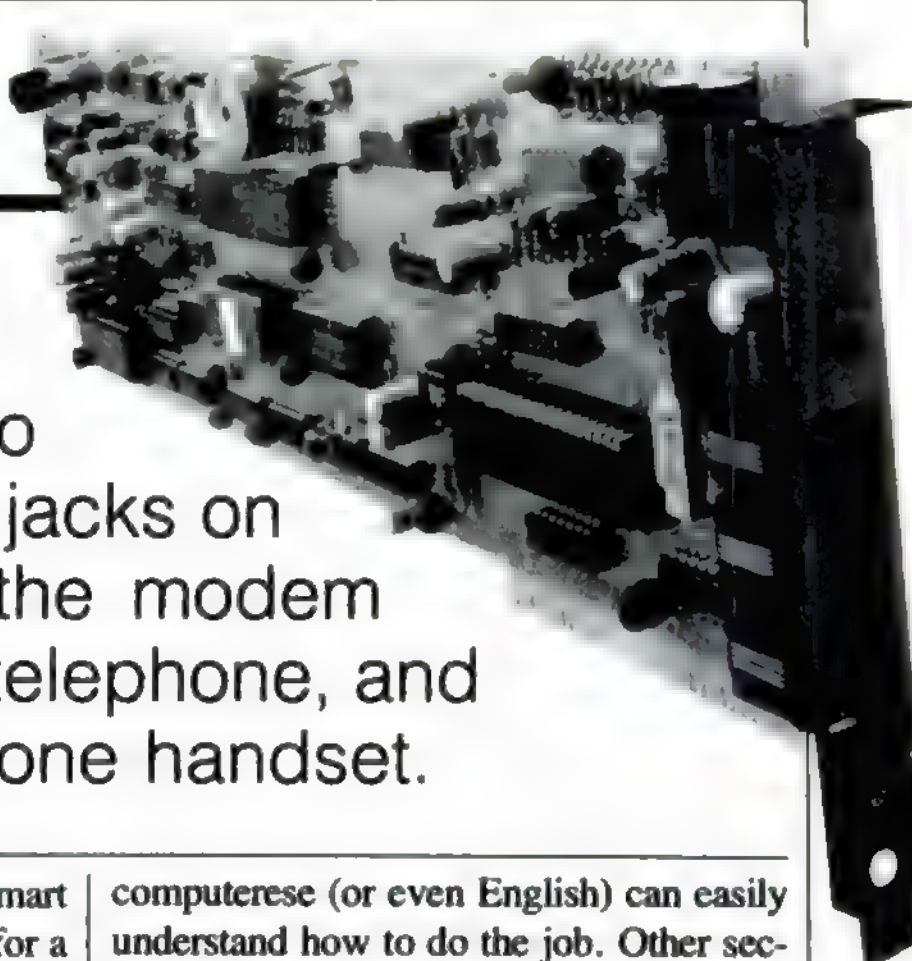
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TWO MODEMS

COM standard mode. In this mode, the POPCOM can send you error and status messages telling you that the modem on the other end is going too fast or too slow, that it has received a busy signal, or that it hears something that sounds like a human voice.

A few commands set 19 different operating parameters in the POPCOM, including the code used to get the POPCOM's attention when it is on line, how long it will wait for a data connection to be established, and how long it will wait before hanging up if the data call is somehow disrupted. This latter feature comes in handy for those with "call waiting" on their telephone lines. Call waiting is an optional feature offered in some parts of the country that signals you with a sharp crackling sound on the line when someone else is attempting to reach you. You can talk to the second caller by pressing the switch-hook and then return to the first caller by pressing it again. Unfortunately, the crackling sound almost always causes a typical modem to think it has lost the signal from the other end and to immediately hang up. But by extending the POPCOM's carrier-off hang-up delay, you may be able to restore communication. You will have lost some characters in the process, but software with error detection and retransmission capabilities will correct this problem.

The POPCOM's ability to detect whether a dial tone is present is another nice feature. Most modems with a dialing capability simply wait a few seconds and then dial. They assume the presence of a dial tone. The POPCOM dial-tone detection feature is important when you are using a shared telephone system and must dial 9, then wait for another dial tone before proceeding. It may become even more important in light of the proliferation of alternative telephone services as a result of the divestiture of AT&T and the introduction of competition into all areas of the telephone industry. These alternative telephone services may have widely varying delays before providing a dial tone. They



The Bizcomp PC: IntelliModem plugs directly into the PC. The three jacks on the near side of the modem attach to the line, telephone, and an optional telephone handset.

are likely to require a system that is smart enough (and patient enough) to wait for a dial tone before dialing.

The voice/data switch on the POPCOM may be its best feature. If both ends of the connection have POPCOM devices, you have only to pick up the telephone attached to the modem and start talking. When the POPCOM at the other end loses the data signal, it will turn on its speaker and the other person will hear your voice. Lifting the receiver at that end turns off the speaker. When you put the phone back on hook, the POPCOM tries to re-establish the data connection, unless it receives a command from the computer. In case you finish a data call but forget to tell the modem to hang up, the POPCOM will hang up if the data connection is not re-established within 30 seconds.

Software and Support

The POPCOM works well with practically any data communications program—from the simplest to the most complex. I used the POPCOM with *PCModem*, *Crosstalk*, and *Smartcom II*. In every case the modem performed up to the full capabilities of the software. The data/voice capability worked well, and the modem responded in either its normal mode or its Hayes-emulation mode.

The POPCOM's manual includes some descriptive diagrams and several quick-reference guides. The instructions for connecting the modem are carefully illustrated to the extent where persons not fluent in

computerese (or even English) can easily understand how to do the job. Other sections of the manual describe how to set the optional POPCOM functions and how to troubleshoot the complete communications system. The manual lacks both a glossary and an index, but it has a good table of contents.

Prentice Corporation maintains and advertises a telephone consultation service for POPCOM users. The manual includes a troubleshooting card to fill out before calling the service. (Many problems with modem systems involve cables and connections and are relatively easy for an experienced person to diagnose.) The manual also includes desirable features such as a "crib sheet" with a condensed list of modem commands and a pop-out notice you can put on a telephone to deter



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TWO MODEMS

people from picking up the telephone handset while the POPCOM is in use.

Taken as a whole, the POPCOM represents a major step forward for modems.

The data/voice feature is useless for communicating with host computers or information utilities such as CompuServe and Dow Jones, but it's truly invaluable for

exchanging data between microcomputers operated by people. Even without the data/voice feature, the POPCOM's packaging and price make it an excellent value.

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PC: IntelliModem

The Bizcomp PC: IntelliModem is contained on a circuit card that fits into a full-size PC expansion slot. The modem takes its power from the PC, and a red LED glows when the power connection is complete. The modem board has jacks for the telephone, telephone line, and an optional telephone handset you can plug in to allow you to use the computer as an expensive electronic dialer. The circuit board is well constructed and the major components have sockets allowing easy replacement. The modem board works with software that addresses either serial port 1 or 2 on the PC. The selection is made by changing the insertion of an 8-pin header plug into one of the sockets on the board. This port selection cannot be changed without removing the board from the computer.

Unfortunately, the Bizcomp PC: IntelliModem does not use the standard Hayes Smartmodem instruction set. Instead, it responds to a unique set of commands designed by Bizcomp. In this command set, you must tell the modem the baud rate, speaker status, and type of dialing to be used for every call. This information is contained in a string of characters entered before the number to be dialed. Another negative feature is that the command structure does not allow you to back up and edit the line if you make an error. You have to abort the line and start over. This isn't much of a problem with a good communications program that automatically sends the correct characters to the modem, but if you enter the data manually, you must be careful not to make a mistake.

PC: IntelliModem Software

Bizcomp supplies its own data communications software, called PC: IntelliCom, with the PC: IntelliModem. PC: IntelliCom is written in IBM BASIC, so its operation cannot be guaranteed on anything other

TWO MODEMS

than a true-blue IBM PC. The software is nicely integrated with the modem and makes extensive use of the PC's function keys. The Bizcomp program captures incoming data to files it creates on the program disk. These files can later be renamed and transferred to another disk, but they must go to the program disk first. Data are stored in a RAM buffer created by the program. When the buffer is full, the program writes the data to the disk. The manual does not describe this feature in detail, but if the system sending you data is not capable of stopping the transmission when it receives an XOFF command, you will lose data while the program is writing to the disk. The PC:IntelliCom software cannot make file transfers using common error detection and block retransmission arrangements such as the *Crosstalk* or *X-Modem* protocols.

PC:IntelliCom does, however, allow you to change the operation of the modem between the voice and data modes. If you are in the data mode, you select the voice mode by pressing the F2 key. If you are in the voice mode, you select the data mode by pressing either the F1 key to turn on the modem that uses the originate tones or the F2 key for the answer tone set. But if you are already in the data mode, pressing the F1 key hangs up. This creates the potential for interrupting a call by accident, resulting in the loss of data or the waste of an expensive telephone call. I would rather have seen one key dedicated to this function or have it backed up with a safety question (such as, "Are you sure?"). Instead, the function keys are re-used in many different ways during the setup and operation of the program. For example, in addition to the problem described above, the F1 key is also used to select the originate mode, select between tone and pulse dialing, select the baud rate, and return to the main menu.

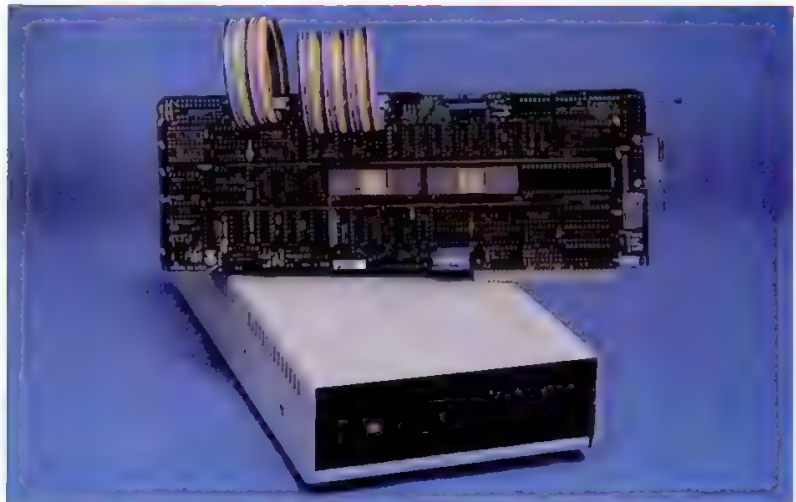
Data and Voice

Switching between data and voice transmission modes is more complicated on the PC:IntelliModem than on the POP-

COM. If the PC:IntelliModem loses the signal from the other end, it prints a message on the screen telling you that it has lost the signal. Then it waits about 20 sec-

onds, and if you have not selected the voice mode by pressing F2, it unceremoniously hangs up. The manual does not indicate any method of changing this wait-

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TWO MODEMS

ing time or any other internal parameters. You must vigilantly watch the screen to know that someone at the other end has switched to voice and is trying to talk to

you. If the switch is made by mutual arrangement, the transfer is easy. But if you think a file transfer is underway and fail to watch the screen, you could miss

the loss-of-signal message until it is too late.

The POPCOM and the PC:IntelliModem can work together on the same circuit and move between voice and data transmission. If the connection starts out in the voice mode, the POPCOM user has only to hang up. If POPCOM has a valid computer connection, it will go into the data mode. The PC:IntelliCom user hangs up the phone and pushes the F1 key to establish a data connection. If the connection moves from data back to voice, the PC:IntelliModem user will have to watch the screen to catch the switch, while the POPCOM user will hear what is happening since the POPCOM speaker is activated as soon as the data signal has stopped.

Other Software

Other software, such as *Crosstalk*, will control most, but not all, of the functions of the PC:IntelliCom modem. *Crosstalk* gives you the capability to load the needed dialing and setup commands into a file that can be automatically transmitted to the modem. In this case, the modem must always communicate with the software at 1200 baud, regardless of the speed the modem is using to communicate with the outside world. This means that the speed-selection option on the menu of *Crosstalk* and similar programs cannot control the speed of the communications. To control the speed, special characters must be sent to the modem as a part of the dialing commands.

A greater problem is the inability of programs other than PC:IntelliCom to switch the Bizcomp modem between data and voice. While it may be possible to use an advanced program such as *Omniterm II* to toggle the status line (data terminal ready) that controls the switch between voice and data, it would require a high degree of technical sophistication. Essentially, you must choose between the voice/data switching capability of PC:IntelliCom or the error-detection and correction capability of *Crosstalk* or similar software. The choice is complicated by the

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fact that the situations calling for data/voice switching capability are often the same ones that could use protocol file transfers. Both of these features are useful during microcomputer-to-microcomputer communications and not during microcomputer-to-host computer sessions.

The Bizcomp manual does an adequate job of describing the installation of the modem, but the majority of it is devoted to the use of the PC: IntelliCom software. The manual contains installation diagrams and a table of contents, but no glossary or index. Surprisingly, the telephone number of the company did not appear anywhere in the manual.

State of the Art

While both the POPCOM X100 and the Bizcomp PC: IntelliModem represent aspects of the state of the modem art, the definition of what is truly modern in this market changes quickly. In fact, it is fairly easy to predict the coming demise of modems as separately marketed devices. Two factors are working to make them obsolete: First, modems are becoming integrated into personal computers; and, second, telephone systems are being digitized. Firm evidence of the trend toward modems becoming an integrated part of microcomputers and terminals is presented by the inclusion of modems in the Radio Shack Model 100 and the IBM PCjr. The Radio Shack Model 100 portable computer comes with its modem permanently installed. The PCjr's modem is marketed as an option, but a special internal slot is provided just for the operation of the modem. Neither of these modems operates at 1200 baud, but advances in large-scale integration techniques such as those evidenced by Prentice in the POPCOM are reducing the size and cost of 1200-baud modems. They will likely be the next step in built-in modems.

The second major trend working against separately marketed modems is the introduction of digital private branch exchange (PBX) telephone systems into the offices of large and small businesses

and corporations. Modern digital telephone systems often include an RS-232C jack on each telephone, which can be used to directly connect a microcomputer or

other terminal device into the telephone system. The conversion between the digital signals from the computer or terminal and the analog national telephone system



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TWO MODEMS

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PBX systems available from such companies as AT&T Information Systems, InteCom, Rolm, and NEC provide combined voice and data telephone service for an average of \$600 to \$1,000 per station. The integration of voice and data will soon include the capability to append verbal comments to digital messages such as text

It is fairly easy to predict the coming demise of modems as separately marketed devices.

or graphs. Systems like this are now being designed by companies such as Wang and IBM. (Interestingly, Wang recently completed a business agreement with InteCom, a major digital PBX manufacturer, and IBM has purchased a large portion of Rolm, another major PBX company.) Digital PBX systems offer many capabilities for companies of almost any size, and they will provide significant competition for the local area network systems using cables that are already being marketed by several companies. The capabilities contained within the digital PBX will quickly reduce the need for separate modem devices in corporate offices.

Nevertheless, at this time and with the equipment now on the market, a 1200-baud modem is a good investment if you need data communications capability. The capability of both the POPCOM X100 and the PC:IntelliModem to smoothly switch between voice and data transmissions is a modern modem feature that is valuable in many situations. And until modems become a part of the computers we buy for personal use and a part of the telephone systems installed in our offices, these two modems will continue to embody the state of the art in microcomputer communication products. ■



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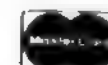
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Using MS FORTRAN On the PC

An excellent piece of software at an outstanding value, Microsoft's FORTRAN compiler provides all the tools needed to convert most mainframe FORTRAN programs to the PC.

FORTRAN, which stands for FORMula TRANslation, is one of the original high-level languages developed for programming mainframe computers. Its primary users have been scientists, engineers, statisticians, and other technical people, and the vast majority of all scientific and engineering software available for mainframe computers has been written in FORTRAN. Now, Microsoft has released a new version of its FORTRAN compiler for the IBM PC. The new release, Version 3.20, is an update of Version 3.13 and adds several major enhancements. With the advent of this high-quality compiler for the PC, many "mainframe-only" FORTRAN programs may become available to PC users.

In fact, much of the interest in Microsoft's FORTRAN will come from people interested in translating programs previously used on mainframes into versions compatible with the PC. This will not only save engineering, architecture, and scientific firms millions of dollars a year in



Illustration: Mark Peberthy

mainframe time-sharing costs but will undoubtedly contribute to greater use of sophisticated analysis packages by small firms that either cannot afford mainframe time, or that simply have never used a mainframe service.

The key question is how much code will have to be changed in the process of translating mainframe FORTRAN to PC FORTRAN. It turns out that Microsoft FORTRAN Version 3.20 is a superset of the ANSI X3.9-1978 subset of standard FORTRAN, which means that many mainframe programs will require comparatively little modification to run on the PC. However, difficulties will remain in character handling, the PRINT statement, and free formatting of input.

FORTRAN's Advantages

In addition to translating mainframe programs, FORTRAN can also be used to write original programs. This has several advantages:

- Programs written using the Microsoft version of FORTRAN will run almost without modification on many mini and mainframe computers. This makes FORTRAN's code much more transportable than, for example, BASIC.
- Microsoft FORTRAN produces extremely fast floating-point arithmetic code, the kind most often used in scientific and engineering applications. In addition, Microsoft FORTRAN supports the 8087



Microsoft FORTRAN Compiler, Version 3.20

Microsoft Corporation
10700 Northup Way
Bellevue, WA 98004

(800) 426-9400
(206) 828-8080

List Price: \$350

Requirements: 140K user space in RAM, one disk drive (196K user space in RAM, two disk drives). 8087 math coprocessor optional.

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FORTRAN programs can easily be written as a series of relatively small subroutines.

coprocessor, which allows real arithmetic to execute as much as 30 times faster than on the PC's standard 8088 chip. This feature is a major selling point for engineering programs that are limited in speed primarily by arithmetic calculations.

- Microsoft FORTRAN allows use of the entire installed memory in the PC. This allows the user to run large programs that include extremely large data blocks. Data can utilize any portion of PC memory not taken up by resident DOS or the program code itself.
- The size of executable code produced by Microsoft FORTRAN is relatively small, which allows large programs to run on PCs with limited memory.
- Many scientific and engineering firms are already familiar with FORTRAN programs and will feel more comfortable with a program written in FORTRAN than in Pascal, for example.
- FORTRAN programs can easily be written as a series of relatively small subroutines. The FORTRAN programmer can thus build up a library of subroutines for use in different programs. In addition, debugging is far easier on small subroutines than on large programs.
- Perhaps most importantly, a tremendous amount of debugged FORTRAN code is available for utilization as subroutines in scientific and engineering programs. FORTRAN programmers can use these existing subroutines to build large, complex programs.

FORTRAN's Disadvantages

Unfortunately, the nature of the language also imposes limitations on programming in FORTRAN. The following

features, taken for granted by BASIC programmers, are not supported by Microsoft FORTRAN:

- Direct cursor control on the screen is not allowed, although it is possible to control the cursor using DOS 2.0 commands executed from within a FORTRAN program.
- FORTRAN has no graphics commands.
- FORTRAN makes no provision for joysticks, light pens, mice, or voice activation.
- Serial ports are difficult to fully control. It is possible to read and write data to or from a serial port, but complete control is lacking.
- Keyboard input cannot be trapped during program execution.
- Random number generation is not supported.
- FORTRAN does not provide a direct way to place binary values in specific storage locations. Microsoft's version has no equivalent to BASIC's PEEK and POKE commands.
- Unlike BASIC, FORTRAN has no built-in editor.
- There is no interpreter available. This means that all FORTRAN programs must be written, compiled, and linked before they can be run, unless you use the DOS utility DEBUG to execute object code.
- No interactive debugger is available. To debug a FORTRAN program, you usually have to insert extra WRITE statements to find the values of variables as the program progresses.

One way to overcome these limitations is to write your own assembly language subroutines to perform any needed tasks. Alternatively, you could use the linker that Microsoft supplies with the package to link FORTRAN programs with existing Pascal or assembly language programs. Unfortunately, writing assembly language routines to interface with FORTRAN is a major undertaking and is not likely to interest programmers who want to quickly produce operable programs. Using the linker is no simple task either, since the

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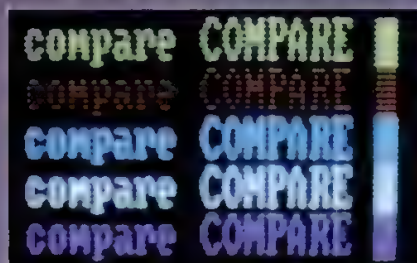
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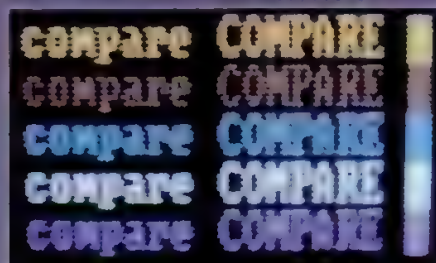
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MS FORTRAN

file-control block in FORTRAN is different from the one used in Microsoft Pascal, and FORTRAN's internal representation of numbers may also be different from that of other languages. Linking a FORTRAN program with a BASIC program is not even mentioned in the manual. While it may be possible, it is likely to be extremely difficult.

In addition, competing languages such as Pascal and C have libraries of machine language subroutines available to perform such activities as cursor control, graphics generation, and communications port control. Until assembly language tools become available for FORTRAN, you should select a different language for systems programs, graphics routines, and communications programs. As things stand, FORTRAN is best suited for scientific and engineering programs.

Microsoft versus "Standard"

Microsoft describes Version 3.20 of FORTRAN as a superset of the full standard ANSI FORTRAN. Much of the full ANSI FORTRAN standard language, and a few features beyond the standard, are supported. Of course, there are many versions of FORTRAN available on mainframes, some of which include features not available in either ANSI or Microsoft FORTRAN. Many commonly used commands are either not supported by Microsoft or are implemented differently on other machines.

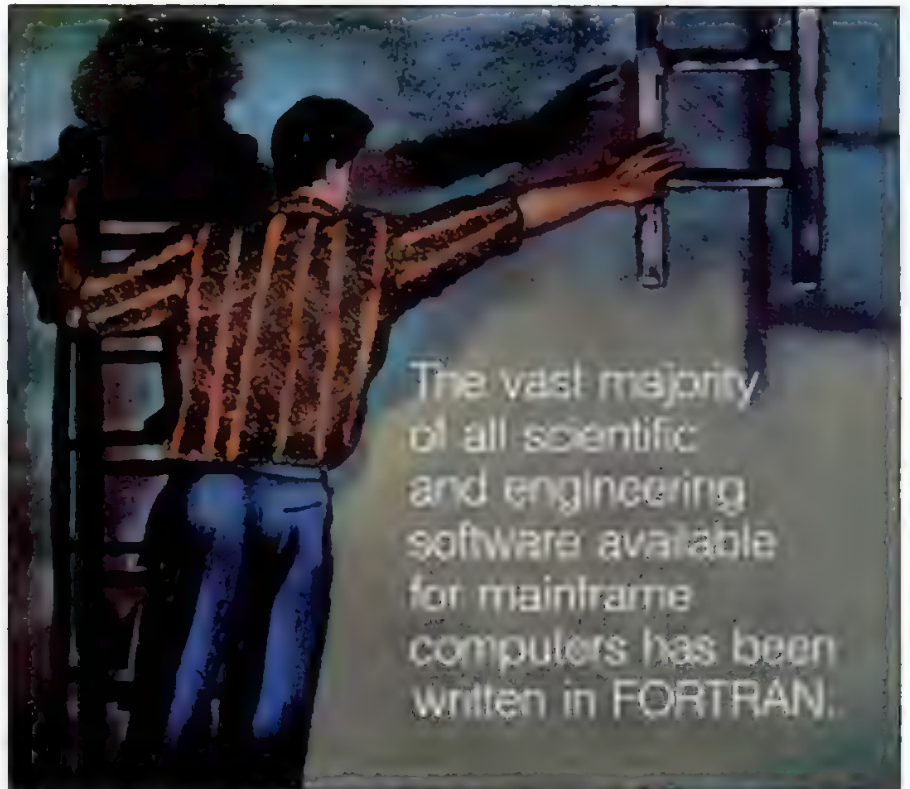
Many FORTRAN compilers support free-format input on READ statements. Many different versions of free format exist; a common one is

```
READ(5, -) A, B, C, D
```

with no associated FORMAT statement. The main advantage of free format is that the user need not line up columns for data entry. The Microsoft implementation of free format uses statements such as:

```
READ(5, *) A, B, C, I
```

In this case, if A, B, C, and I are not explicitly typed, the program will expect three



real numbers followed by an integer. If the input were 1,2,3,4, for example, the 1,2, and 3 would be converted to reals of the form 1.0 while the variable I would be assigned the value 4. Inputting a real as the fourth value will produce an error, since integers can be converted to reals on input, but not vice versa. If it is necessary to read a double-precision, logical, or character variable, the variables should be declared with a TYPE statement before the READ occurs.

The PRINT statement is supported by many FORTRAN compilers, but not Microsoft's. The PRINT statement is designed to allow easy output where exact formatting is not critical. A typical PRINT statement syntax might be:

```
PRINT 10, A, B, C, D
```

The simplest way to get around the problem is to use a word processor to replace all PRINT statements with the statement

```
WRITE(NW, )
```

where NW is the unit that you wish to

write to. Later, the blanks are filled in with the number of the FORMAT statement you use.

Microsoft FORTRAN supports direct sending of data through either a serial or parallel port, although the documentation is not very clear on this point. The best way to send data to a printer is to use an OPEN statement of the form:

```
OPEN(6, FILE='LPT1:', STATUS  
='NEW')
```

Any data subsequently sent to unit 6 will then be printed on printer LPT1:. Similarly, to send data to communications port 1, simply open a 'COM1:' file if you have a printer attached to a serial port.

Alternatives include using Ctrl-PrtSc to toggle the printer on before running the program, or inserting PAUSE statements in the program at strategic points. The user could then be prompted to press PrtSc to print the screen visible at that time.

It is also possible to direct output to a file for later viewing. Microsoft FORTRAN supports sequential, random, and

MS FORTRAN

binary files, so the programmer has tremendous latitude in file manipulation. Directing output to a file is probably the best approach to presenting a small amount of data on the screen while saving full data output for later printing using DOS' TYPE command.

One nice feature of Microsoft FORTRAN is its support of character variables. A character variable is simply a string of characters enclosed by single quotation marks, for example 'ABCD'. These variables can be used in dimensioned arrays and also in relational expressions such as

```
IF (A .EQ. 'XYZ') GO TO 10.
```

In order to declare a character variable, you use a type declaration statement of the form:

```
CHARACTER INPUT*64, A*2
```

In this case, INPUT becomes a 64-character variable, while A becomes a 2-character variable.

Many older, mainframe FORTRAN compilers do not allow for character variables. You must use a formatted WRITE statement to print an error message on one of these machines. If the programmer wants to emulate character variables, he might declare a given variable as real or double precision, then assign a string to the variable using a DATA statement. For example, some compilers accept the following:

```
REAL X(6)
DATA X/'THIS', 'IS
      A', 'SHORT', 'TIME',
      'SSAG', 'E' /
WRITE(6,100) (X,I = 1,6)
100 FORMAT(6A4)
```

This type of tortured syntax may be replaced with the much cleaner code:

```
CHARACTER X*21
DATA X/' THIS IS A SHORT
      MESSAGE' /
WRITE(6,100) X
100 FORMAT(A21)
```

or the even simpler code:

```
WRITE(6, '(A)') ' THIS IS A
      SHORT MESSAGE'
```

Microsoft FORTRAN's ability to handle character variables is so much better than that of most of the older mainframe FORTRANs I have worked with that I usually rewrite the character-handling code completely.

A hard disk is an excellent idea for serious FORTRAN programmers.

Version 3.20 implements complex variables of the form $A + Bi$, where A and B may be integer, real, or double-precision variables. In addition, the standard FORTRAN arithmetic operations for complex variables are supported, including addition, subtraction, complement, and so on. Previous versions of Microsoft FORTRAN did not allow for complex variables, so electrical engineers should be happy with this one. Also, BLOCK DATA subprograms are supported in Version 3.20, which will make mainframe program conversions easier than they were in previous versions.

As you can see, the main problems Microsoft FORTRAN presents are likely to be connected with DATA, PRINT, CHARACTER, and free-formatting statements. None of these problems is particularly difficult to handle. Simply make sure that variables assigned values with a DATA statement are not mentioned in COMMON blocks and check that the character variables that you define to replace other types of variables are not accidentally left dimensioned.

Word Processors

Writing or altering FORTRAN programs is best done on a word processor, but a word processor good for letter writ-

ing may not be suitable for programming. I use *Proofwriter* because it provides the programming features I need. For example, it easily edits files of indefinite length. This is extremely important for modifying mainframe programs, many of which are thousands of lines long. The easiest approach is to download the entire program from the mainframe onto the PC via a modem, then break the file into subroutines for easy editing and compiling. I normally search the program for END statements and open a new file for each subroutine.

Fast search and replace capability is also important for a word processor used in programming. With a 5,000-line program containing many PRINT statements, for example, a global replace statement is virtually a necessity. Your word processor must also be capable of inserting control characters directly into the text. This is necessary to directly control cursor movements by sending escape character sequences to the screen with WRITE statements.

A word processor used for FORTRAN programming should be capable of converting tabs to spaces. Most FORTRAN statements start in Column 7. The easiest way to enter these lines is to tab over to Column 7. Microsoft FORTRAN correctly identifies a tab in Columns 1 through 5 as a signal to start reading program code in Column 7, but not all FORTRAN compilers are as forgiving. If you plan to transport the code, the safest approach is to convert each tab into six blanks at the start of each line.

Finally, a word processor that allows multiple indented paragraphs will be very useful for writing structured programs.

Hardware Requirements

Theoretically, Microsoft FORTRAN requires a minimum of one single-sided disk drive and 150K RAM (after the operating system is loaded). In practice, the compiler would be extremely awkward to use with only one disk drive. I recommend two double-sided disk drives and at least

MS FORTRAN

256K RAM. A hard disk is an excellent idea for serious FORTRAN programming.

It is also possible to compile and link programs using a RAMdisk. The main difficulty with this approach is the size of the compiler program and the problem of linking several large (or many small) object modules together. To compile a FORTRAN source program, you need to make two passes, using a different program each time. The first pass loads FOR1.EXE (119,890 bytes). The second pass loads PAS2.EXE (97,152 bytes). The simplest approach to using a RAMdisk is to copy the program you wish to compile onto the RAMdisk and place the floppy containing FOR1.EXE and PAS2.EXE into the A: drive. Log onto the RAMdisk and type A:FOR1 followed by A:PAS2. The program object code will then be created on

the RAMdisk, and you can go on to compile each subroutine in turn.

Linking may be more of a problem. The linker requires 39,680 bytes in DOS

Curiously, Microsoft does not mention the use of a hard disk or RAMdisk in its manual.

1.1. In addition, the standard linking library, FORTRAN.LIB, of 85,504 bytes must be available. The default math library requires an additional 35,328 bytes (the 8087 math library requires only an additional 18,432 bytes). It is possible to

load both the linker and library onto a RAMdisk, but there wouldn't be much room left for the object modules.

During the linking process, the required memory may exceed the sum of the object modules plus the library. If this occurs, the linker sets up a file called VM.TEMP. If your RAMdisk is too small to hold all the object programs and VM.TEMP, the process aborts. You could copy the object programs onto the RAMdisk and leave the linker and library on the A: drive, but this would sacrifice much of the RAMdisk's speed advantage.

One other problem arises if you don't have a hard disk. FORTRAN programs are particular about syntax and are often full of errors when first created. The compiler will flag most of these, and you will then have to edit the source file. On flop-

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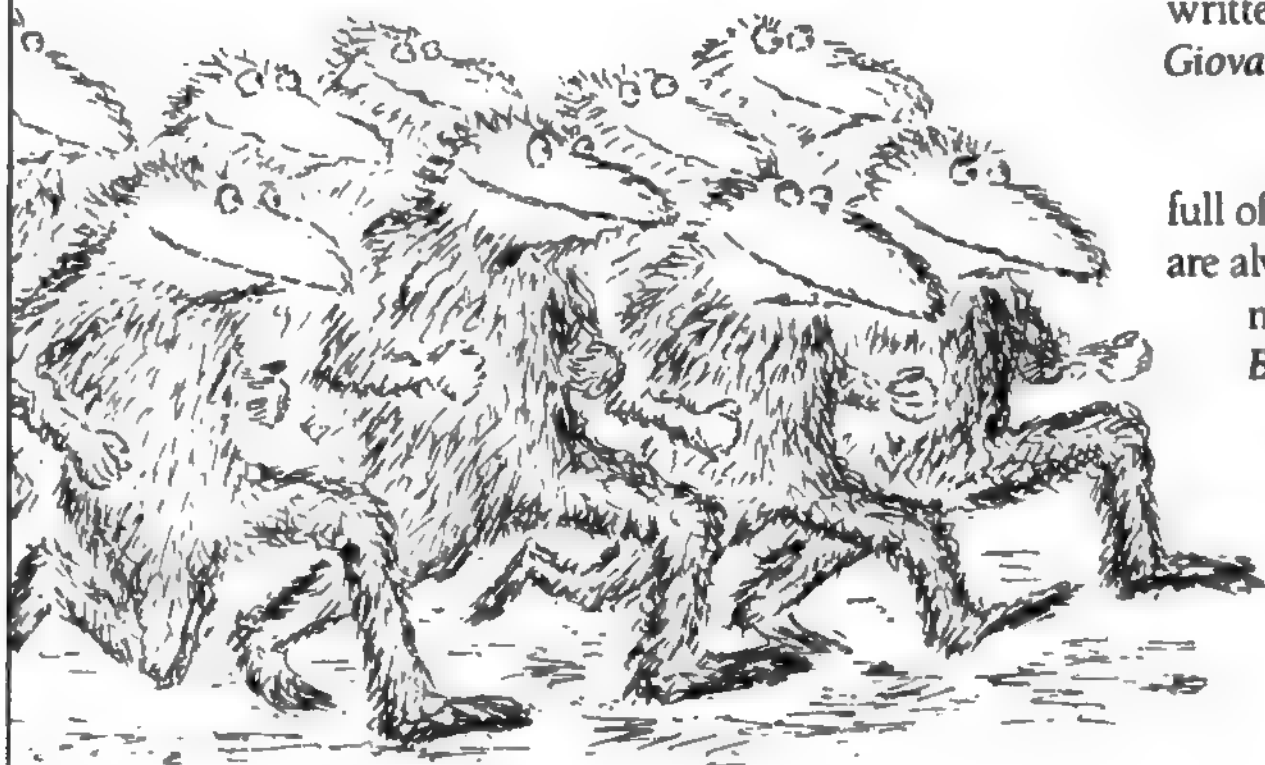
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MS FORTRAN

pies, this means reloading your editor, retrieving your file, making the changes, writing the new file to disk, and restarting the compiler again. You'll soon learn the meaning of the "floppy shuffle." A hard disk reduces the aggravation to a more tolerable level.

Curiously, Microsoft does not mention the use of a hard disk or RAMdisk in its manual. Presumably, Microsoft believes that anyone who has these devices will be able to install the compiler without instructions. Although the process is quite straightforward, the following suggestions may make it even easier:

- Copy all of the supplied programs onto a separate directory in the hard disk. I call my directory /COMPILER/FORTRAN. This step is easy since the programs are not copy protected.
- Decide which FORTRAN library to

use. If you don't have an 8087 chip, use MATH.LIB and FORTRAN.LIB. If you do have an 8087 chip, read the directions in the manual carefully before selecting a library.

- Decide which linker to use. Use LINK.V2 with DOS 2.0, but use LINK.EXE, the default linker, for DOS 1.1 applications.
- Set up a new directory to compile and link applications programs (I call my directory /FORTRAN/PROG). Copy the selected linker and library into this directory, and name them LINK.EXE and FORTRAN.LIB, respectively.
- Set up an AUTOEXEC.BAT file to automatically define the PATH at startup. Make sure the PATH includes your compiler directory, FORTRAN program development directory, and word processor directory.

Editing, Compiling, and Linking

You are now ready to edit, compile, and link FORTRAN programs. The simplest approach is to break each program into a main routine and a series of subroutines that will be edited and compiled separately. Once each routine is fully debugged, you can link them together into a workable program. Working on small subroutines is much easier than trying to compile a large program all at once, and there is no difference in final code size.

Initially, you should compile each subroutine using the \$DEBUG metacommand (see Chapter 6 of the Microsoft manual). With \$DEBUG on, arithmetic errors such as divide by 0 are flagged, and the line in the source code where the error occurred is displayed at runtime. If \$DEBUG is off, the generated code is about 40 percent smaller, but if the program crashes

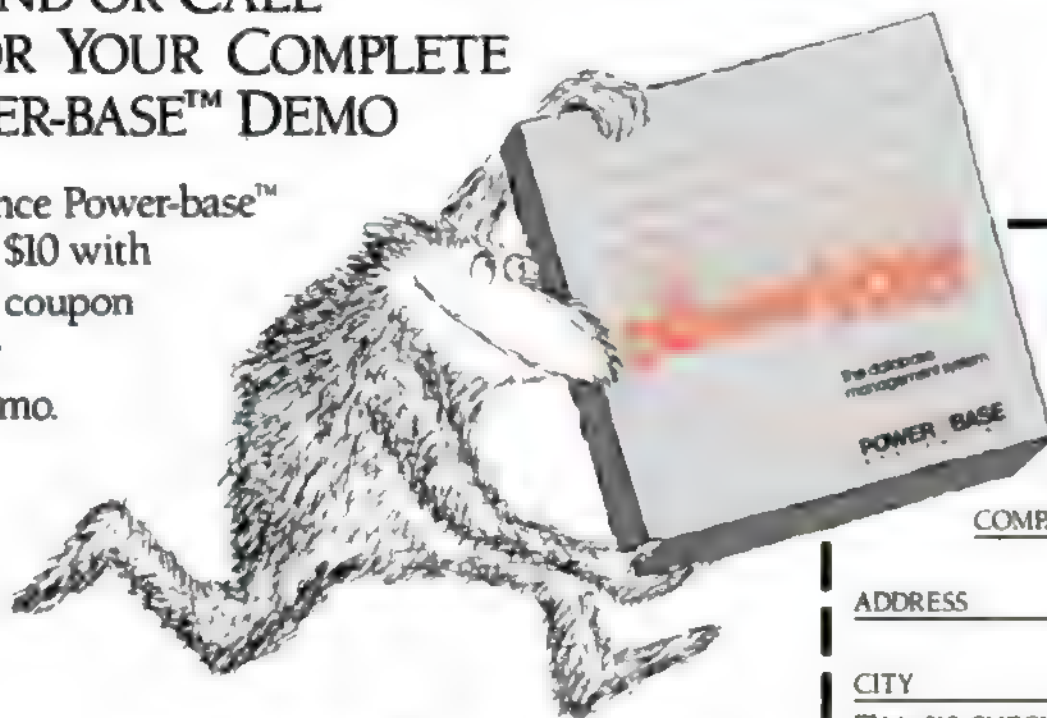
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during execution, it does not indicate the associated line number, which makes it extremely difficult to figure out what went wrong. Once you are certain that the program works correctly, recompile and link all routines using \$NODEBUG to produce smaller, faster code. If an error occurs later, you can rerun the same data using the \$DEBUG version to localize the problem.

One serious complication may develop. If you have any DIMENSION or COMMON statements in your program, space will be set aside at runtime for any named variables. When you run the program, values will be associated with these variables and stored in specific addresses within the computer. Termination of the program does not erase these values. When you rerun the program later, the variables so created will retain their original values unless you reset the computer in the interim.

This can lead to some very subtle difficulties. Suppose you run a program that assigns the value 10.0 to A, and A is mentioned in a COMMON block. If you rerun the program and reassign a value to A, you won't have any problem. However, if you use a different input file, and A is not reassigned, you will be left with the old value of A still in memory. Any program statements that refer to A will execute using the old value. This can produce erroneous calculations or printouts.

FORTRAN possesses no CLEAR statement. You must reinitialize each COMMON block and DIMENSIONED array that will not be overwritten either at the beginning or end of each program, or reset the computer using Ctrl-Alt-Del after running the program. Failure to do so can lead to errors that are extremely difficult to detect.

Compilation and Linking

The speed of compilation and linking depends on the type of system you are using. As a benchmark, I compiled a bridge-girder design program containing a main program of 38 lines and a single subroutine of 384 lines using three different

system setups. The results can be seen in Figure 1.

A RAMdisk is clearly the fastest way to compile and link, although a hard disk is considerably easier to use. If no hard disk is available, creating a RAMdisk can practically double the speed of compilation and linking.

One of Microsoft FORTRAN's main advantages is its ability to use the 8087 chip for fast execution. Because this is so important, Microsoft provides several different ways to compile and link a program, each of which produces differently sized programs that run at various speeds.

Version 3.20 of the documentation carefully outlines the various options, although it is a bit difficult to understand exactly what is happening.

To understand the options, first look at the libraries supplied with the compiler, MATH.LIB, 8087.LIB, and ALT-MATH.LIB. You specify which of these libraries the linker will use by naming the one you want to use MATH.LIB.

If you have an 8087 chip installed, the 8087.LIB library will produce the smallest, fastest code possible, but programs linked with this library will run only on machines equipped with the 8087 chip. If

	Hard Disk	Floppy Disk	RAMdisk
Load FOR1	5 sec	11 sec	3 sec
Run pass 1	45 sec	65 sec	38 sec
Load PASS2	6 sec	12 sec	3 sec
Run pass 2	132 sec	188 sec	105 sec
Load LINK	3 sec	6 sec	2 sec
Run linker	63 sec	111 sec	57 sec
Total	254 sec	394 sec	208 sec

Figure 1: A table showing execution times for various FORTRAN subroutines using three different data storage media: hard disk, floppy disk, and RAM disk. The routines were run on a sample program containing a main program of 38 lines with a subroutine of 384 lines. (Note: These results used Microsoft FORTRAN Version 3.13, but results with Version 3.20 should be nearly identical.)

Compiled with \$NOFLOATCALLS	= 38,999 bytes object code, time = 4:45
Linked with 8087.LIB	= 58,154 bytes executable, time = 1:15
Linked with MATH.LIB	= 66,650 bytes executable, time = 1:09
Compiled with \$FLOATCALLS	= 41,975 bytes object code, time = 5:15
Linked with 8087.LIB	= 66,194 bytes executable, time = 1:13
Linked with MATH.LIB	= 73,708 bytes executable, time = 1:19

Figure 2: A table showing the size of code generated and the time required for some possible compilation and linking combinations, using the sample program from Figure 1. All compilation and linking was done on a hard disk.

MS FORTRAN

you don't have an 8087 chip, you must use either the original MATH.LIB library or the ALTMATH.LIB library. A program linked with MATH.LIB will use an 8087 chip on machines equipped with one, although the program will run slower than one linked with 8087.LIB.

If you don't have an 8087 chip, you can obtain some speed increase by using ALTMATH.LIB. The math routines in this library are optimized for speed on machines lacking the 8087 coprocessor, but the results are not as accurate as those obtained using either of the other two math libraries. In addition, running a program

linked with ALTMATH.LIB on an 8087 equipped machine is pointless, since the 8087 chip is ignored.

During compilation, you have the option of using the \$FLOATCALLS metacommand in any subroutine (the default is \$NOFLOATCALLS). With \$NOFLOATCALLS, the program interrupts the 8088 chip for each floating-point operation performed by the 8087 chip. If you link with the MATH.LIB library, this means that the 8087 chip is entirely interrupt driven. This saves code space but is not as fast as generating specific subroutine calls to the 8087 as part of the pro-

gram. In order to generate subroutine calls to the 8087, you must use the \$FLOATCALLS metacommand. This generates additional code, but the arithmetic is done faster, so the overall effect is a faster program.

If you use \$FLOATCALLS with the MATH.LIB library, you will generate subroutines that emulate 8087 arithmetic using the 8088 chip. Since the 8088 chip handles only 16 bits at a time, versus 80 bits for the 8087, doing arithmetic with the 8088 will be slower than with the 8087. As a result of chip design and other factors, the 8087 chip is about 30 times faster than the 8088 chip for double-precision arithmetic.

Figure 2 shows the size of code generated and the time required for each different compilation and linking option. The source code is a 617-line, 25,000-byte continuous-beam-design program with a moderate amount of floating-point arithmetic.

Further insight about the performance of the 8087 chip can be obtained by studying the timed results for the execution of different phases of HOBCW.EXE, a 2,500-line hydraulic-analysis program with considerable floating-point arithmetic in Figure 3. The program was compiled using the standard MATH.LIB library with \$NOFLOATCALLS.

We can see that the 8087 chip has no effect on disk-read speed or screen-writing speed. It did improve computation speed 12 times, which is a fairly typical result for engineering programs. If the program had been compiled using \$FLOATCALLS, there would have been perhaps a 10 to 20 percent improvement in computation speed, but the load time for the program would have increased because of the additional code.

These tables lead to the conclusion that if you will be running the program exclusively on 8087 equipped PCs, the best way to compile is with the 8087.LIB library. If you want maximum speed at the expense of additional code, use the \$FLOATCALLS option. If you don't have the 8087

	PC With 8087	PC Without 8087
Read data off floppy	4 sec	4 sec
Compute results	3 sec	36 sec
Write answers to screen	13 sec	13 sec
Total time	20 sec	53 sec

Figure 3: A table comparing the execution times for various phases of a sample program between a standard PC and one equipped with an 8087 math coprocessor.

```
CHARACTER X*23
X = ' TEST OF PROGRAM OUTPUT'
WRITE(*,10) X
10 FORMAT(A23)

WRITE(*,'(A23)') X

WRITE(*,*) ' TEST OF PROGRAM OUTPUT'

WRITE(*,20)
20 FORMAT(' TEST OF PROGRAM OUTPUT')

WRITE(*,'('' TEST OF PROGRAM OUTPUT'')')

WRITE(*,'(23H TEST OF PROGRAM OUTPUT)')

WRITE(*,30)
30 FORMAT(23H TEST OF PROGRAM OUTPUT)
```

Figure 4: A selection of code blocks that will write the message "TEST OF PROGRAM OUTPUT" to the screen, followed by a line feed.

MS FORTRAN

chip, or want your program to run on PCs with or without the chip, link with the standard MATH.LIB library. Again, for maximum speed at the expense of additional code, use the \$FLOATCALLS metacommand.

Screen Writing

A very common computer operation is writing data to the screen or a file. Since this operation is so important, it's worthwhile to examine FORTRAN's options and speed in detail. There are many different ways to print data or messages on the screen. For example, the blocks of code in Figure 4 will all print the message "TEST OF PROGRAM OUTPUT" to the screen, followed by a line feed.

It turns out that each of these program blocks writes to the screen at exactly the same speed, presumably because they are all compiled and linked into the same machine language instructions. Interestingly, the screen-write speed in FORTRAN is slower than in interpreted BASIC. The screen-write speed varies depending on whether you have the color/graphics card or a monochrome card installed, and on whether you are using a PC or a Compaq computer. Figure 5 compares the times, at different configurations, used by the PC and the Compaq to write "TEST OF PROGRAM OUTPUT" to the screen 1,000 times.

It's clear that FORTRAN is significantly slower than BASIC or the DOS command TYPE. FORTRAN and a color

board screen write at about 220 characters per second, which isn't much faster than some dot matrix printers. If greater speed is necessary, the best method is to write the data to a disk file, and either view the output later using the TYPE command, or use Ctrl-PrtSc to toggle the printer on and print the output. Another alternative is to use a print spooler program and send data directly to the printer. This is fast, but can easily overwhelm a small spooler. Of course, writing your own assembly language screen-write routines should speed up output considerably.

Debugging

Perhaps the most disappointing aspect of Microsoft FORTRAN is the quality of its error messages. The longest compile-time error message is eight words, and most are less than four words. Errors that occur during linking are now shown in Appendix H of the Microsoft FORTRAN manual (an improvement over previous releases, where link errors were listed only in the DOS manual). Still, deciphering the messages is not always easy.

For example, the link error "Symbol defined more than once" is explained by Microsoft as follows: "MS-LINK found two or more modules that define a single symbol name." What this means is that a global variable such as a subroutine name is defined differently in two or more places within your program. Since the FORTRAN linker library has many named subroutines, it's easy to accidentally call one

of your subroutines by the same name as a linker subroutine, bringing on this error message. To correct the problem, simply rename your subroutine and rewrite your CALL statements.

Another problem occurs during debugging. There is no simple method to stop the program in the middle and display the value of variables. You could insert WRITE statements into the program, but this is cumbersome. Perhaps a future version of Microsoft FORTRAN will provide an improved debugging tool.

Conclusions

The Microsoft FORTRAN compiler is an excellent piece of software, and, at a retail price of about \$350, it is an outstanding value. Version 3.20 provides all the tools needed to convert most mainframe FORTRAN programs for use on the PC and represents a tremendous improvement over Version 3.13.

The support of the 8087 chip is outstanding, and the ability to read and write sequential, random access, or binary files using the OPEN command is a definite plus. The handling of character variables is well done, and the ability to perform free-format reading and writing is impressive. The ability to use the PC's entire memory for program and data storage extends its power tremendously. Microsoft provides the ability to link FORTRAN programs with Pascal or assembly language programs, which may run faster or provide extended capability. Perhaps most important, there seem to be very few bugs in this compiler, in dramatic contrast to IBM FORTRAN's 45 pages of documented bugs.

On the negative side, screen writing is slow, and the error messages are not always helpful. There are no supplied graphics commands, and there is no support for calling BASIC subroutines. Hopefully, some of these deficiencies will be corrected in future editions. On balance, though, the pluses far outweigh the minuses, making this FORTRAN compiler an outstanding product. ■

	PC w/Color Board	PC w/Monochrome	Compaq
FORTRAN	1:40	1:12	1:08
Interpreted BASIC	1:17	0:57	0:53
Compiled BASIC	1:06	0:48	0:48
TYPE	1:17	0:57	0:50
Floppy disk write	0:12	0:12	0:12
RAM disk write	0:08	0:08	0:08

Figure 5: A table comparing the times to write "TEST OF PROGRAM OUTPUT" 1,000 times on different configurations of the PC and the Compaq.

In Search of a Significant Dialog

Dialog's complex command structure makes this on-line service difficult to use.

In-Search helps by leading you through it step by step.

If you've ever had trouble using an on-line information service, you'll appreciate the merits of a helping hand called *In-Search*. From Menlo Corporation, this new \$400 package is designed to make it easier to search the collection of databases offered through Dialog Information Systems, Inc., of Palo Alto, California. It is a powerful, well thought out package that will be valuable to both the professional who spends several hours a day with Dialog and the occasional user.

To understand how *In-Search* works, you need to know something about Dialog. One of the country's leading database



vendors, Dialog provides access to roughly 200 distinct databases. If you spend some time reading the service's documentation and approach Dialog in a calm, one-step-at-a-time manner, you should find that learning how to use this information service is not particularly difficult. The skills required are more often those of library science and simple Boolean logic than of programming.

The first step in Dialog searching is to

decide which database is most likely to have the information you're looking for. The documentation will help you here. First, the "blue sheets" (after the color of the paper) contain detailed information on each database, including subject matter, how it is organized and indexed, and the name of the organization that compiled the database. By the name alone you can often make an educated guess about which database is most appropriate. For example, Patlaw is a database on patent law.

However, you may not immediately be able to match up a subject area with one or more particular databases, or you might not know of all databases containing information on your topic. You would then turn to Dialog database #411, Dialindex, which is an on-line help feature. Dialindex lists 53 broad subject areas such as BusNews and Educ. Each term refers to two or more relevant databases. For example, included in the BusNews (business news) heading are Dialog's Magazine Index, the National Newspaper Index, Newsearch, and three other databases.

To use Dialindex, you type in the subject you wish to search for and one of the



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IN-SEARCH

category headings. Dialindex tells you how many hits it found in each of the subsumed databases, eliminating guesswork and saving you from the frustration of searching an inappropriate database.

Once you've decided which databases to search, you can use seven fundamental commands and nine more advanced ones (see Figure 1) to actually get the data out of the database and onto your computer.

An example of Dialog's simplicity of command structure is the SELECT command, the basic command to find all references to a particular term. For example, entering SELECT WIND causes Dialog to search for all records in the selected database that mention the term *wind*.

However, *wind* can be used as a record descriptor, a record identifier, or even as an author's name. The SELECT command might therefore have several forms, such as SELECT WIND/DE or SELECT AU-WIND. The first of these two forms searches for *wind* as a subject in a record; the second searches for an article written by an author named Wind. These different formats can at times be confusing.

Dialog's databases range in cost from around \$40 to \$165 per hour. The meter runs for the full time you are connected to a database. If you sign on to SciSearch, for example (\$165 per connect hour), and take a five-minute coffee break, you're drinking a \$14 cup of coffee. You'll want to optimize your on-line time.

Masking the Power

At first glance, *In-Search* looks like an enhancement of a good telecommunications package to which some handsome graphics have been added. *In-Search* can log on to Dialog automatically, record all traffic between the user and Dialog, send break signals, and print out records transmitted from Dialog. The graphics enhancements include windowlike displays of broad subject areas, on-screen worksheets, pop-up windows for extra commands, and a section that displays basic information—such as the subject area and time period covered—about each data-

base. The advantage of this approach is that you have everything you need in front of you—no balancing the Dialog documentation on your lap as you gaze at the screen. *In-Search* also provides a plastic keyboard overlay that indicates the linkage between function keys and commands.

Its similarity to a telecommunications package, however, masks *In-Search*'s real power. Since this program allows you to prepare much of your work before logging on, "dead air" time is minimized, which saves you time and money.

The point of *In-Search* is that it helps you to clarify a search and eliminate some potential confusion; it consequently simplifies Dialog use considerably. *In-Search*'s built-in help features and detailed explanations illuminate every nook and cranny of each of its databases.

In-Search has divided all the Dialog databases into four broad subject areas: business, government, and news; engineering, mathematics, and physical science; arts, education, and social sciences;

and biology and medicine. Each of these four subject areas is on a separate "category" disk that contains specific information about each database, such as the names and contents of subfields, examples of each subfield, help information, and so forth.

Using *In-Search* is quite simple. I'll describe the process for my two-drive PC; according to the vendor, *In-Search* also runs gracefully on an XT. The manual contains detailed instructions for both types of systems, as well as for a rich variety of PC lookalikes.

To use *In-Search*, you must prepare the *In-Search* system disk. This is a familiar process; you copy DOS 2.0 onto the system disk and enter various parameters (local telephone access numbers for Telenet, Tymnet, and Uninet, your Dialog password, the type and speed of your modem, and so on). These processes are made easier by a batch file on the *In-Search* system disk and a menu-driven parameter collection system.

(continued)

Dialog has seven fundamental commands, as follows:

BEGIN: Begin searching Dialog database n.

SELECT: Select a keyword for which to search.

COMBINE: Use Boolean logic (AND, NOT, OR) to combine search results using logical calculus.

TYPE: Display search results on the user's printer.

EXPAND: Display a list of terms related to the primary search term.

PRINT: Print a list of search results on Dialog's printer and have them mailed to user.

DISPLAY: Display search results on a CRT.

There are also nine commands for more advanced work, such as EXPLAIN, KEEP (file search results), LIMIT (restrict search results in some way), SORT (sort on-line output), and other housekeeping or administrative commands.

Figure 1: Dialog's fundamental and advanced commands.

IN-SEARCH

To use *In-Search* to search Dialog, you insert the system disk in the A: drive, perform a standard boot, and type in INS at the prompt. At the same time, you insert one of the four category disks in the B: drive. (If you have a hard-disk system, you first copy the data on the category disks onto the hard disk.)

The first functional *In-Search* screen displays three windows. The first shows which category disk you're using; the second, a list of broad subject areas within that category; the third, a list of the relevant databases for that subject area. Each succeeding level moves you closer to your target database.

For example, suppose you're after some information about a company's earnings. You'd use the Business disk. The first usable screen displayed provides a list of broad business topics, such as accounting, acquisitions & mergers, and banking.

You then use the cursor movement keys to scroll through the list of topics. When the term "Annual Reports" is highlighted in the window, you press the Enter key, which takes you to the third window. This window displays "index cards," which contain a name and a brief description of the database. In this case, the window displays the information for Disclosure II, a business database.

Once you've settled on the specific database you want, you again press the Enter key, and *In-Search* displays a worksheet for that database. (You can also go directly to the database you want to search without going through the "topics" screen.)

Filling in the worksheets is straightforward; you enter the word or phrase you are searching for and, if necessary, instructions for Boolean searching (for example, combine all items that are common to two search results). Pressing the F9 key will give you access to special indexes and submenus that allow you to tailor your search.

In this particular case, looking for company earnings, you enter the name of the

company. Since there are more than 75 fields in this database, the most efficient way to search is to indicate that the phrase you entered (say, "Sperry Corporation") is a company name. Pressing a few keys will tell *In-Search* to limit its search to Dialog's Company Name field. The use of these additional search features is greatly facilitated by the instructions at the bottom of each screen. You don't have to press the help key (F1), although it's always available.

Another helpful feature of *In-Search* is that you don't have to worry about entering the Dialog command precisely; *In-*

All commands sent to Dialog and all information you access can be saved on a disk for later use.

Search does it for you. For instance, people who occasionally use a numeric 1 instead of a lower-case alpha L, or who use numeric 0 and alpha O interchangeably, will be spared having to resolve these differences.

Logging On

To make the connection with Dialog, you press the F5 key. *In-Search* then automatically dials Dialog, connecting directly or via Telenet, Tymnet, or another value-added network, and takes care of all the housekeeping details, such as transmitting the Dialog password and redialing if necessary. If you are using a dumb modem, *In-search* tells you what number to dial but takes over after you've established communications. One especially nice feature of *In-Search* is a screen display that indicates your status: you're either "on-line," "off-line," or "working" (waiting for a response from Dialog).

If your primary pathway to Dialog is

unavailable for some reason—if, for example, the local Telenet number is busy or the Telenet port for Dialog is not available—*In-Search* will automatically try a second route and then a third, if necessary.

Dialog initially returns the number of references (or hits) it has found. Retrieving and printing these requires a separate command. To retrieve the actual references, you press the F9 key, which brings up a window with several subcommands. These are controlled again with the cursor movement keys and the Enter key.

To display the references, you hit F9 and use a subcommand, which brings up a pop-up menu. The menu asks you which hits you would like to see and in which format (there are eight Dialog display formats, ranging from short to complete). This operation soon becomes almost automatic.

All commands sent to Dialog and all information you access can be saved on a disk for later use. For example, if you conduct the same search periodically, you can enter the search strategy once and recall it later. This is particularly useful in long command sequences, which are subject to typing errors and the inadvertent skipping of some commands.

Two Perspectives

At first I was doubtful as to how valuable *In-Search* was. I am a self-taught Dialog user, though probably not an efficient one, and my first *In-Search* efforts seemed far clumsier than simply using Dialog commands directly. Learning *In-Search* seemed hardly worth the effort. This puzzled me, since the vendor was so enthusiastic and had put a great deal of effort into the package. So I asked the vendor to put me in touch with users at opposite ends of the experience spectrum—an expert and a novice.

Barbara Newlin is an information consultant and former professional researcher in Berkeley, California. She used Dialog for several hours a day over the course of 5 years and is now writing a book about the

IN-SEARCH

service. According to Newlin, using *In-Search* with Dialog is an easier way for a novice to start out because it simplifies the system. You can edit a strategy on-line while Dialog is searching, and experienced searchers need not be connected when they're putting together search strat-

I tried to give *In-Search* a problem it couldn't solve, but it passed my tests every time.

egies. If you multiply these savings by the number of expensive databases a searcher is likely to use, you'll save connect charges. And all the information is available within *In-Search* itself.

At the other end of the spectrum is San Francisco-based Gil Freeman, a CPA and chief financial officer of The Sharper Image, a retailer of upscale electronic, health, and fitness items via its nationally distributed catalog.

The Sharper Image's success depends heavily on getting its catalog into the hands of an affluent audience. This business buys prepared mailing lists for this purpose and supplements those lists with information culled from a Dialog database called the Electronic Yellow Pages, a compilation of dozens of Yellow Pages directories.

"I knew about Dialog but was scared off initially by its complexity," Freeman explains. "I'd attempted to use Dialog without *In-Search*, but *In-Search* made it much simpler. I'm happy with what it's done for us, and, given its abilities, it's an inexpensive product. It paid for itself. It's perfect for a novice."

After speaking with Newlin and Freeman, I returned to *In-Search* and tried to suppress the knowledge I gained from using Dialog directly. I theorized that I had tried to make *In-Search* bend to my own method of using Dialog. I fought with

it instead of letting it work on its own terms.

My subsequent efforts were considerably easier. I suppose that I'm at that awk-

ward stage—more knowledgeable about Dialog than many users but considerably less familiar with it than professional information retrievers. I'm therefore an



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atypical user. I tried to give *In-Search* a problem it couldn't solve, but it passed my tests every time. Part of my problem lies in the power of the *In-Search* command set. There's a natural trade-off between power and ease of use.

It was not necessary to tell *In-Search* what kind of printer I was using—it printed out the material I asked for, complete with boldfacing, with no problems. The manual is also quite good and easy to use. I found some places here and there that I felt could use some sharpening, but these were by no means major stumbling blocks. All manuals should be as clear and readable as this one.

The Dialog database collection for which *In-Search* is intended changes constantly. Prices fluctuate, new databases are added every month, and some databases change format on occasion. Without

In-Search printed out the material I asked for with no problems.

some update capability, *In-Search* would be out of date and useless shortly after you bought it. To address this need, the manufacturer will periodically send updates, on disk, to registered users. These will then be merged with the information already contained in *In-Search*.

Quibbling

I do have two minor quibbles about using *In-Search*. First, your password is embedded on the system disk, which means that a miscreant could "borrow"

your disks—and with them your password and Dialog account—and run up charges. (The vendor could rectify this with a minor modification that requires you to enter a counter-password.) If others are likely to "borrow" your copy of *In-Search*, keep it under lock and key.

And second, *In-Search* insulates you from Dialog's commands, which deprives you of a potential learning experience. To save you the trouble this experience would entail, of course, is the whole point. However, if you've never seen Dialog run without any intermediate software layer and you are curious about what actually goes on behind the scenes, you might find it interesting to enter the commands yourself, or at least to look over the shoulder of someone who is using Dialog that way. Doing so, incidentally, will only add to your appreciation of *In-Search*. ■

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Ultima II is a great big wonderful world that will probably frustrate the hell out of you the first few months you spend explor-



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ing it. If you are not ready for the kind of mental gymnastics this game puts you through (which make learning to play chess look easy), you won't think it's such a great big wonderful world at all. In fact, you may call it a "stupid game" and put it on the top shelf. But if you hunger for an animated fantasy-role-playing game that lets you create an individual alter ego, and if you're ready to place the old brainpan on the front burner and bring those creative, puzzle-solving juices to a stiff boil, then

Ultima II is your meat and potatoes.

One of the big attractions of fantasy role-playing games lies in being able to create your own character, and this is the first thing you do in *Ultima II*. The package consists of three disks: a program master disk containing the game rules, a galactic disk, and a player master disk containing the game character generator. After copying the player master to a blank disk, you are ready to assign your character point values for six traits: strength,

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agility, stamina, charisma, wisdom, and intelligence. You also choose your character's race (human, elven, dwarven, or hobbit), sex (male or female), and profession (fighter, thief, cleric, or wizard).

Ultima II's high-resolution graphics make it more than a text adventure. The map of the playing board, which is much larger than a single screen, depicts the four major continents of Earth surrounded by oceans, and the map scrolls as your character moves across various terrain. Be aware that *Ultima II* is played in real time, so you can't sit around pondering what to do next. If you don't make a move within 10 seconds, the computer will "pass" for you. Physical combat is also a large part of the game. Even if you're not the belligerent type, your character must be ready to defend himself.

A Purpose in Life

The object of *Ultima II* is to search out and destroy the evil sorceress Minax. You don't know where she is, what she looks like, or anything about her modus operandi. Your character will have to discover these things and more before learning what to do, much less how to do it. Consider yourself warned.

Your character begins with just a small food supply, some gold, and several hundred "hit points" (Some of which are used up each time he sustains a blow). When your alter ego runs out of food or hit points, the game ends.

All player commands are executed with single keystrokes, but in this limitation is not bothersome because there are 30 different actions you can execute. (Wizard and cleric characters each have access to one of two special submenus offering six additional commands that represent spells.) The arrow keys make up four of the standard commands; they are used for movement. The other 26 are mnemonic commands from A to Z. For example, E means Enter, O means Offer, and S means Steal. The T (for transact) command allows you to speak to the hundreds of game characters you'll meet and you

should talk to everyone because you never know who might have valuable information. Of course, everything costs money and adventurers are not on anyone's payroll, so you have to continually replenish your character's gold supply by winning battles with the enemies and devils roaming the countryside.

Sounds like a lot of game, doesn't it? Well, get this: There are actually *five* maps of the world, each representing a different time period ranging from prehistoric times to 1990, and your characters can and must travel between them by slipping into time doors when they appear.

You can't solve *Ultima II* without visiting all five time periods, because each one holds items essential to the mission. For example, you can get a horse in the first time period, but not a ship, an airplane, or a rocket. A rocket? That's right—before you're through your character will have visited the nine planets of our solar system (and a few uncharted ones if you're really clever), all of which are contained on the galactic disk.

There is much, much more to *Ultima II*, but I want to leave some surprises for those of you with the mental guts to take on this "monster" game. On PC's scale of one to six, *Ultima II* rates:

FUN:	5.5
CHALLENGE:	5.5
GRAPHICS/SOUND:	4.5
TOTAL SCORE:	15.5



Sorcerer

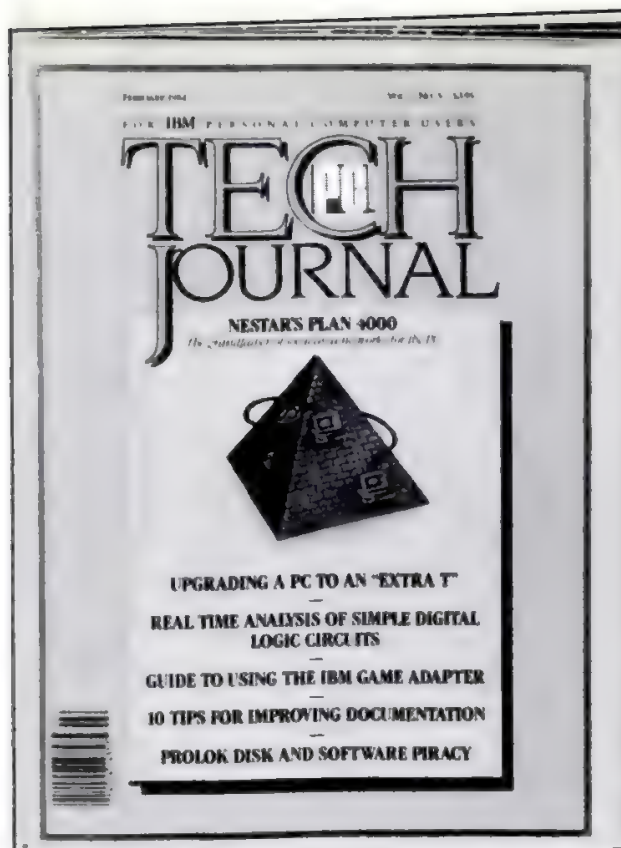
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The folks at Infocom have a literary style that infuses their text adventures with a wonderful sense of humor, and *Sorcerer* is no exception. When I boot a game for the first time, for example, I expect to see



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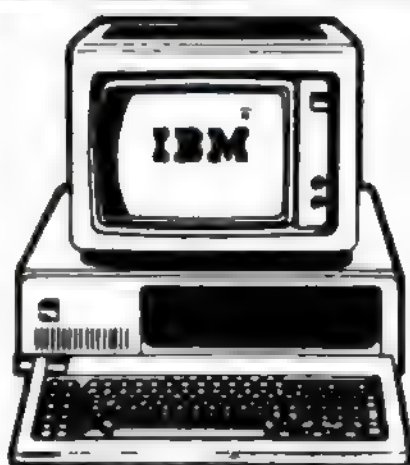
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PC ARCADE

a traditional title and copyright screen. When I booted *Sorcerer*, however, the screen read: "You are on a path through a blighted forest. The trees are sickly, and there is no undergrowth at all. One tree here looks climbable. The path, which ends here, continues to the northeast. A hellhound is racing straight toward you, its open jaws displaying rows of razor-sharp teeth."

I hadn't done anything yet, but I was already in big trouble. I figured the hellhound would overtake me if I took the northeast path, so I typed in the command CLIMB THE TREE and hit the Enter key. The computer countered with "You are on a large gnarled branch of an old and twisted tree. A giant boa constrictor is slithering along the branch toward you! The hellhound leaps madly about the base of the tree, gnashing its jaws."

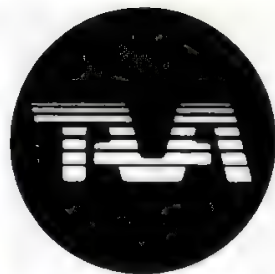
Gadzooks! Then a series of progressively more worrying sentences were followed by a lightning bolt striking my character's chest, causing him to wake up in a cold sweat and realize he had been dreaming! Then came the expected copyright screen. Before I had even entered the game, Infocom was controlling my heartbeat.

Enchanter series

Sorcerer is the second game in the Enchanter series. If you're familiar with the first, *Enchanter* itself, you'll feel right at home with the setting. In *Sorcerer*, Belboz, chief cheese of your Enchanter's Guild (who was always there to resurrect you in *Enchanter*), has been kidnapped. You don't know who did it or where Belboz is being held. It would be nice to have some help, but when you wake up in a cold sweat from your dream, you find a note from Frobar, another enchanter, which says he has taken everyone else into town to go shopping. There is no one in the eerie guild hall but yourself, and leaving is no easy task. Sorcery is a lonely business.

The world outside the Enchanter's Guild Hall is expansive, consisting of hun-

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dreds of interesting, strange, and well-described places. You'll explore dungeons and torture chambers, read to your heart's delight in a seemingly endless encyclopedia, examine intricate wall carvings, paintings, and statues, cruise an underground highway, negotiate a three-dimensional maze of mirrors, and take the wildest roller coaster ride of your life in an amusement park that seems to have been created solely for *your* amusement.

Nonviolent

What really makes *Sorcerer* stand out from the crowd of text adventures is its predisposition against violence. You won't find any guns or knives or clubs with which to battle your enemies. Instead, your tools are scrolls that contain spells and vials that hold potions with which you can cast spells. You begin the

game with three beginner's spells and a magic book into which each new spell must be written before it can be used.

There are three modes of play (or skill levels) in *Sorcerer*: superbrief, brief, and verbose. The game defaults to the brief mode, which gives you a full description of every scene the first time you visit it. On return to that scene you will only get a description of pertinent objects or things that have changed. The verbose mode gives full descriptions of all rooms every time you visit them. And superbrief is just what it sounds like; you get the name of the location only and must ask for fuller descriptions of any items in the room. These modes may be changed any time you feel you're getting too much or too little information.

Sorcerer often presents several ways to accomplish a task, and while one way

might make your next task easier, another might make it more difficult or even impossible. So when you feel stuck, backtrack and try another approach, carefully noting any differences in the results. The puzzles of *Sorcerer* are quite difficult and intricately woven together, and no help is available without writing to Infocom. (The fictitious Bilk & Wheedle Fiduciary Insurance Company, set up by Infocom, will mail you clues for \$3.)

PC's three-part, one-to-six rating scale is not quite fair to a text adventure game without graphics and sound, but *Sorcerer* conjures up impressive scores in the other two categories:

FUN:	5.5
CHALLENGE	5.0
GRAPHICS/SOUND:	Nonapplicable
TOTAL SCORE:	10.5



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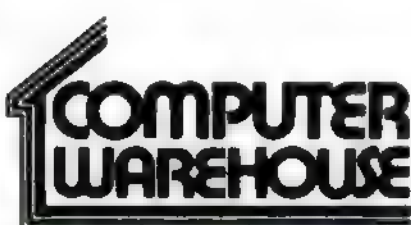
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Great Summer Reading: A Dynamic Duo

Follow along as a master of computer game design explains his craft, or delve into a compendium of useful, interesting information about the history and principles of computing.

Since the aspiring game designer has little literature to study, any book on the subject ought to be welcomed by game players everywhere—and this one deserves a herald of trumpets. Although not a professional author, Chris Crawford's qualifications for writing a book on this subject are impressive. In 1979, after many years of designing and playing board games, Crawford became a computer-game designer for Atari, where he authored *Energy Czar*, *Scram*, *Tanktics*, *Eastern Front*, *Legionnaire*, *Excalibur*, and *Gossip*. He currently leads Atari's Games Research Group. I recommend his book to those interested in designing games or merely in playing them.

Crawford hopes to awaken the public as well as the game designer to his vision

of computer game design as an untapped art form. "People are beginning to realize that the world of computer games is a vast wasteland," he writes in the preface. Crawford attributes this situation not to



The Art of Computer Game Design: Reflections of a Master Game Designer

Chris Crawford
Osborne/McGraw Hill
830 Bancroft Way
Berkeley, CA 94710
(415) 548-2805
Copyright: 1984
Cover Price: \$14.95
ISBN 0-88134-117-7

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technical limitations of the medium itself nor the programming skills of the designers, but to the fact that "the technology of computer games has been in the hands of technologists, not artists."

The book begins with a definition of games in general and a discussion of some of the reasons people play them. The chapter called "A Taxonomy of Computer Games" breaks the field into generally established categories, with discussions of classic games like *Space Invaders*, *Pac-*


Man, *Apple Panic*, and *Temple of Apshai* provided as background material. Crawford's point here seems to be that skill-and-action games are the entry point into the world of computer games.

In another chapter, Crawford examines the role of the computer as a game technology, detailing the strengths and weaknesses of the medium and how each can be exploited to advantage or ignored to disadvantage. Essentially, this chapter amounts to half a dozen flexible rules or design precepts that, Crawford argues, are not heeded by most software programmers. In his view this has given rise to the "humongous heap" school of computer game design in which an overly simplistic structure is buried under its special features. "These people design with a shovel instead of a chisel," writes Crawford.

Design and Programming

Crawford sees the processes of game design and programming as two separate skills. Despite this, he argues, the two must work in unison and must both come from the same creative mind. "Committees are good for generating red tape, deferring decisions, and shirking responsibility," he writes, "but they are useless when it comes to creative efforts."

The most valuable feature of *The Art of Computer Game Design* is Crawford's use of his own game designs to illustrate how



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BOOK REVIEW

things can go right or wrong. He is not above using his own failures as examples, and some of his stories are amusing and interesting beyond their value to the budding game designer. An entire chapter devoted to the development of his recent *Excalibur* game should convince the skeptical that the design of a computer game depends on more than just a good idea.

The book ends with a discussion of the future of computer games. Crawford feels that game designers shouldn't depend on holography, laserdiscs, body sensors, and other futuristic technologies. He admits limitations of current home computer systems, but steadfastly maintains that artistic immaturity is an even greater liability. "If Chaplin could do so much with black and white film and no sound, why cannot we do good work with 8 bits and 48K?"

—Phil Wiswell

Overcoming Computer Illiteracy

Susan Curran and Ray Curnow

Penguin Books

40 W. 23 St.

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(212) 807-7300

Copyright: 1983

Cover Price: \$12.95

ISBN 0-14-007159-8

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The Penguin Computer Book, published last year in Great Britain, has now been issued in the United States under the new and rather awkward title, *Overcoming Computer Illiteracy*. It could be a worthwhile addition to your library.

Susan Curran and Ray Curnow, the authors, are identified as a husband and wife team with strong backgrounds as

both writers and consultants in computer engineering. Curnow participated in a 1978 government study on the impact of micro-electronic technology. Curran has written several computer-related books for lay audiences.

No attempt has been made to adapt the writing to an American audience. Prices are given in pounds, figures are totted up, and so forth. These eccentricities are charming rather than annoying.

Fortunately, this is a book about computing, not computers, for there are too many books devoted to hardware and how to choose it. Computing, on the other hand, is what the hardware is for. The authors assume little or no knowledge of either electronics or computers on the part of the reader. They only presume a degree of intelligence and curiosity.

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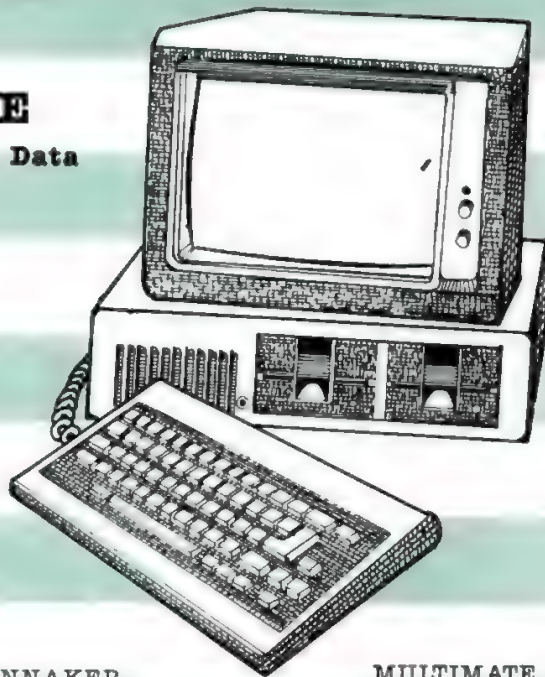
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BOOK REVIEW

ferent means of storing, manipulating, and presenting information, which they then relate to binary arithmetic. They touch briefly on electronic theory before going

on to logic gates (which have been explained in a more elementary and understandable fashion elsewhere—Joseph Be-kin's *The Electronic Cottage*, for exam-

ple). What the reader derives from the book is an understanding of various computer-related principles and their relationship to computer construction and output.

Brief History

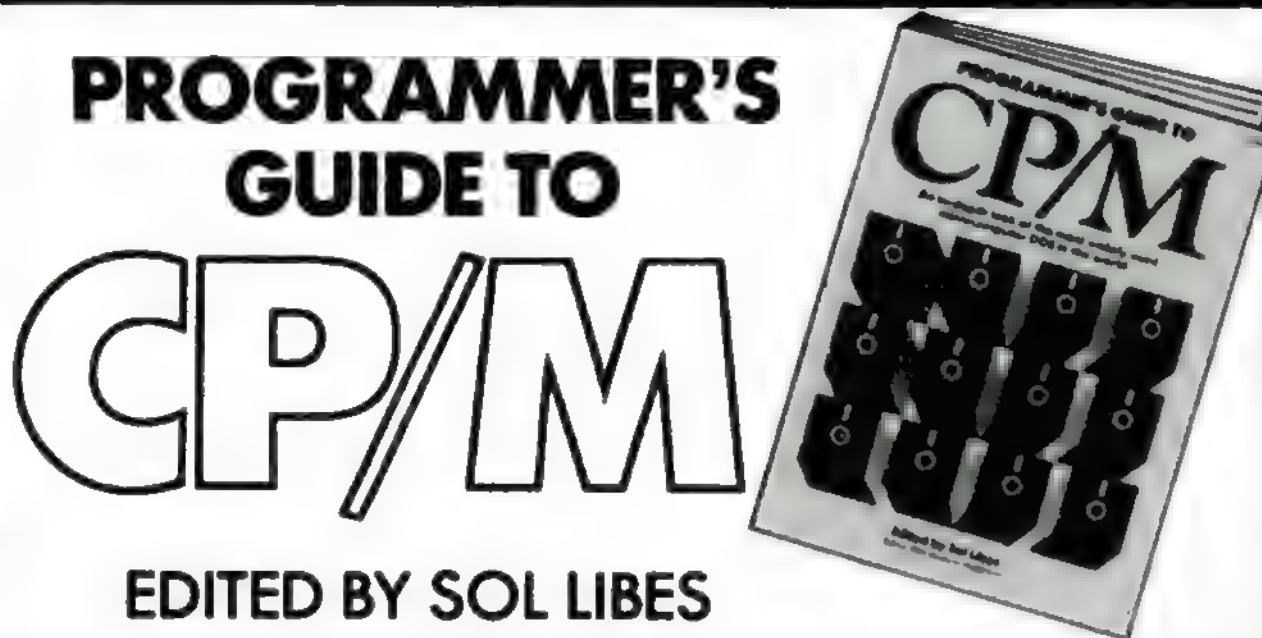
The history of computing is covered briefly in an early chapter that proceeds logically and informatively from the abacus through analog calculators to computers. Babbage, Lovelace, Boole, Turing, and all the other pioneers are given due credit. This chapter also includes a description of early devices used for input, storage, and presentation of computed information. I learned that the "delay line," a long tube filled with fluid, was an early storage device in which sonic signals held and stored information. Other chapters cover today's computer technology.

The single thing that impressed me most about *Overcoming Computer Illiteracy* is its completeness. Everything is here, and everything is explained. Further, the book is supported by an excellent glossary, a good index, and an adequate bibliography.

As I read it, I constantly ran into definitions and explanations of those computer-related terms that we all think we understand in context but can't really define (such as "duplex" and "asynchronous"). Programming at all levels, from machine code through the high-level languages, is explained, as are the differences between program compilers and assemblers and the use of flowcharts in programming.

Some material here is not really pertinent to American readers, such as a short chapter on the Emma, a training computer that is not, as far as I am aware, available in this country, and another on how the U.K. Meteorological Office uses computers. The TRS 80 is used as an example of a small business computer and there's no mention at all of IBM's contributions to microcomputing.

If you're looking for a basic, well-written, serious background text that covers the whole subject of computing, this is a fine choice. —A. Scott Earle



Here's an important collection of CP/M insights that you'll never find in any CP/M manual. CP/M is the most popular microcomputer DOS in use today, and this widespread use has generated many innovative techniques and enhancements of CP/M. *Programmer's Guide to CP/M* tells you what these enhancements are and how to put them to use, how to get around apparent limitations of a CP/M system and why CP/M is far more versatile than you might have imagined. Every article in *Programmer's Guide to CP/M* originally appeared in MICROSYSTEMS between

January 1980 and February 1982. Except for this collection, these articles are now unavailable! *Programmer's Guide to CP/M* gives you an in-depth look at CP/M from the viewpoint of the programmer—the individual who creates the software that interfaces directly with CP/M, or who is installing CP/M on systems for which configurations do not already exist.

Contents include "An Introduction to CP/M," "The CP/M Connection," "CP/M Software Reviews," "CP/M Utilities & Enhancement," "CP/M 86" and "CP/M Software Directories." 200 pages, \$12.95.

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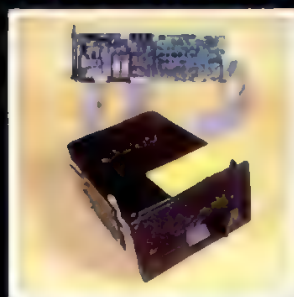
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Please will supply you with labels for a mailing to selected customers. It can send customer information to your word processor for a promotional letter. And it can receive data from

your spreadsheet program. *Please* will even look up a name and company for you, your Hayes Smartmodem* will dial the phone number, and you're ready to talk!

Taking this same sales database, you might also want to define special

fields for a custom Output Plan. With a defined field for "COMMISSIONS DUE,"

Please can automa-

tically compute each salesman's commissions, and print them out in a report of your own design. All this and more, just for saying "Please."

And if you ever change your mind and want to change the structure of your database, please feel free. Step-by-step instructions show you how.

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"Make it snappy, Please!"

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Please"



"Put it here, Please."

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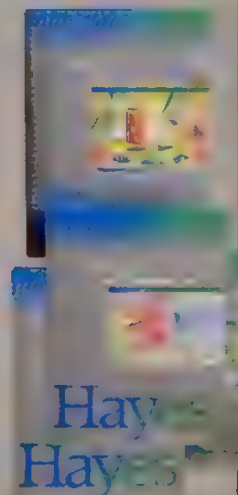
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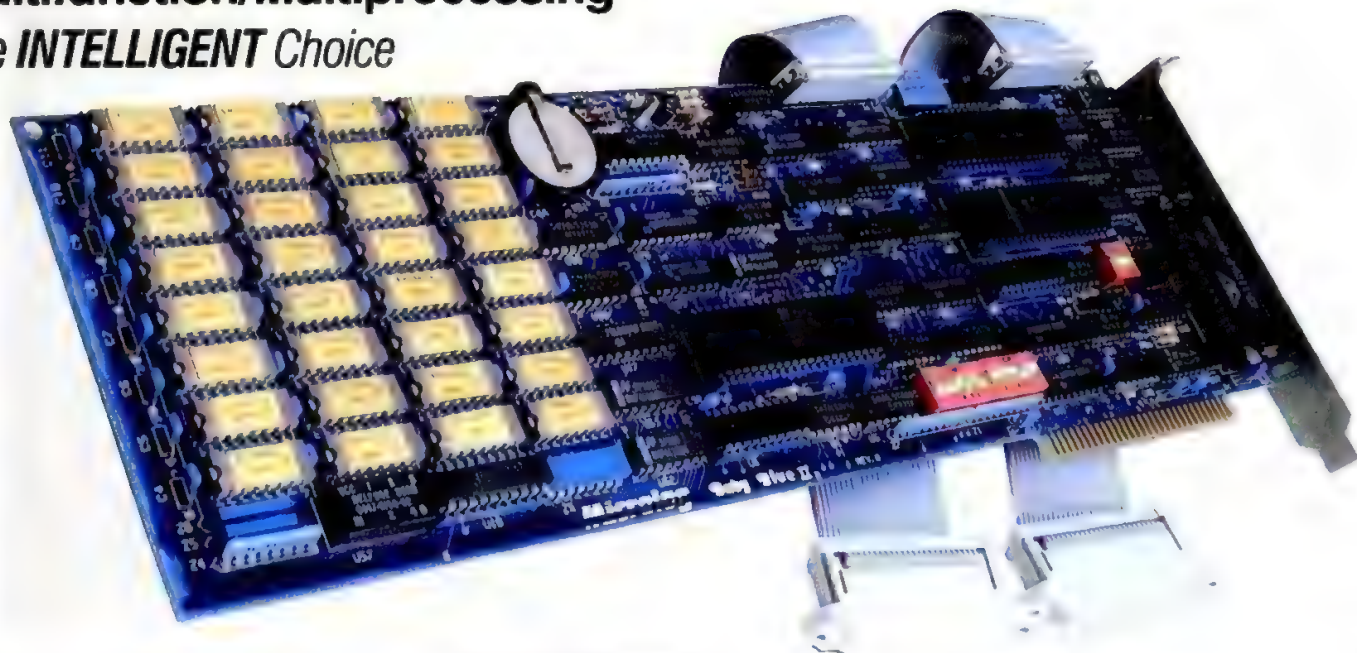
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Systems utilities

PDQ RAMdisk Software: create a FAST pseudo-disk drive of any size in available system RAM. The DOS 2.0 version lets you change the size of your RAMdisk from the keyboard.

Print Buffer/Spooler: a TRUE print spooler: the Z-80 buffers and manages printing independent of your PC. Unlike other so-called "spoolers", this one won't stop your printer or slow you down when you start another job.

Clock Software: sets Baby Blue II's clock and initializes the system clock at boot time—never type the time and date again!

Communications

Smart Terminal Emulator Package (STEP): talk to other microcomputers or connect to larger host computers, as an asynchronous terminal through Baby Blue II's serial ports. Unlike other "smart terminal" programs, STEP offers full emulation of popular video display terminals (the standard package includes Televideo 950 and Hazeltine 1500).

IBM 3101, DEC VT100 and many others are optionally available. You can send or receive text files, and with STEP's unique Sessions Menu, changing your configuration is a keystroke away.

BSTAM File Transfer Utility: Transmit and Receive text, HEX, and binary files (including .COM files) without errors and without fuss. BSTAM is easy to use, with all configuration parameters handled transparently under STEP.

CP/M-80 compatibility

Baby Blue Conversion Software: Microlog's famous CP/M Emulator turns CP/M-80 programs into PC-DOS programs for fast, efficient execution on Baby Blue II. Completely transparent operation using standard PC-DOS commands—freely mix PC-DOS with CP/M programs and text/data files on the same PC-DOS disks.

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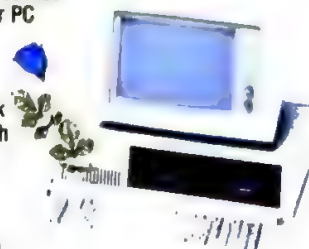
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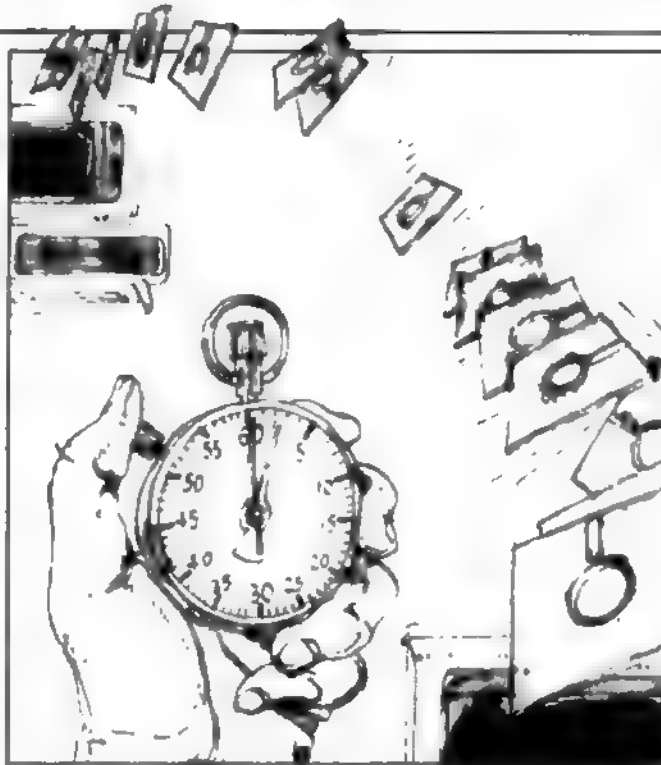
Microbiology departments have been among the last hospital laboratories to feel the influence of computers, largely because of the costs involved. In my last column, I described MICROBE, an eight-module program I wrote to automate the microbiology laboratory at the University of New Mexico Hospital/Bernalillo County Medical Center. The laboratory staff used this program to build a database. The system is an economical substitute for a dedicated hospital laboratory computer.

Three primary data retrieval needs recur in the microbiology lab: listing the outstanding cultures that have not yet been completed; answering telephone inquiries on recent culture results; and searching through the database for answers to epidemiologic questions. They require three different modules.

List Generation

The worklist generation module provides the laboratory technologist with a list of each culture for which a result has not yet been entered into the database. This ensures against lost cultures, and it also guarantees that results for each culture are entered as soon as they become available.

Selecting the generation module from the main menu automatically initiates a scan of the recently received specimens. The program separates the data on the



basis of workstation by examining the alphabetic prefix in the accession number that identifies each culture. The lists that are output to the printer contain the patient's name and hospital number, the date of receipt, and the decoded anatomic source of the culture. Each worklist also contains a header identifying the workstation and the date printed.

In any hospital laboratory, there is a lag between the time results are known and the time they appear on the chart. Consequently, telephone inquiries concerning the most recent results are a frequent occurrence, particularly in microbiology where the time of availability of the results is uncertain, owing to the whims of the growing organisms. MICROBE's quick-search module is designed to shorten the

time required to answer telephone inquiries. An input template (shown in Figure 1) is used to select the search criteria. You must fill in either the Patient Name or Hospital Number field before beginning, or the program will display an error message and move the cursor to the name field.

The extent of the search depends on the date you enter on the search screen. If both date fields are blank, the search begins on January 1, 1983, and proceeds to the present. This can take quite some time as the database becomes larger. If you do specify a date, the program examines the date-directory files. The first logical record number for that date is selected; the search begins there and extends to the present. You may restrict the search to a particular type of test by entering the alphabetic prefix of that test in the appropriate field.

As the program locates records satisfying all of the search criteria, it displays them on the screen. When the program has located the records, it displays them in pages of 20 records each. You may review other pages by using the PgUp and PgDn keys. When the record of interest is on the screen, you can decode the entry by positioning the cursor at the beginning of that line and then pressing F3. The screen is cleared, and the record is displayed on line 1. The decoded entry appears below, including the date received; the source; the

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CIRCLE 316 ON READER SERVICE CARD

SCIENCE

Name:			
Hospital Number:			
Date In:			
Date Out:			
Test Code: .			
A = Anaerobe	F = Fungus	R = Routine	V = Virus
B = Blood	N = Antigen	S = Strep Only	
D = Direct Exam	P = Parasite	T = TB	
F1 Main Menu F3 Decode F4 Display Hits F9 New Search F10 Search			

Figure 1: An input template to select search criteria in MICROBE.

organism; and a list of the antibiotics to which the organism was sensitive, partially sensitive, and resistant. If no organism code is present, the entry is labeled "Results Pending."

Most Flexible Module

Printed output cannot be made from this module (except with the PrtSc key), nor can ranges of dates or organisms be searched. If you need any of these, use the extended-search module. This module lets you search the database by any combination of patient name/hospital number, ward, dates, source codes, organism codes, test type, or epidemiologically significant organisms. The selected records may be displayed to the screen or printed. If printed, the records may be decoded or not, and may be sorted into alphabetical order by patient name. One or more of the first 12 fields must contain a target before the program will begin the search. After you have entered all the parameters, you can begin the search by pressing F10.

The date fields in this module differ slightly from those in the quick-search module. If you do not specify a date, the

search will still begin on January 1, 1983, and proceed through the end of the database. If you specify an initial date, only records matching the date will be retrieved. For a range of dates, all records between the two dates are retrieved.

If you direct the output to the screen, the search proceeds exactly like a quick search. If you direct the output to the printer, the program stores all results until the end of the search and sorts them if needed. MICROBE does a quick sort using the patient's name as the sort key. In a compiled program, a 450-name list can be sorted in slightly over 1 second with no noticeable delay between the end of the search and the beginning of the printing. A sample of a decoded, printed output is shown in Figure 2.

The extended search module can answer questions such as these:

- Late in the course of a complicated hospitalization, the Infectious Disease consultant is asked to see a patient. What cultures have been received on this patient since admission, and which were positive?
- How many *Staphylococcus aureus* wound infections have occurred this

ANDERSON ROBERT E 123456 ER R291 403711 403819 72 5 155 010 200 200 101	
Source: Urine, unspecified collection	Received: 2/7/1984
Organism: Escherichia coli	Quantity: >= 10E5
Sensitive to: Cephrin Gent Nitrofur Nalidixic	
Intermediate to:	
Resistant to: Amp Tetra Trimeth	

Figure 2: Decoded output from an extended search.

month in the surgery intensive care unit? Is this more or less than the number that occurred 3 months ago?

● Has a particular patient had any other positive blood cultures with the same organism in the last 6 months during his three hospital admissions?

● How many admissions have there been for pediatric meningitis this year, and what are the organisms?

Purging Negative Results

After a short time, usually a few days, there is little use for the negative results. These can be purged from the database and archived to floppy disks using MICROBE's purge module. Decreasing the size of the database in this way speeds up search process. In addition, backing up the file takes less time; the backup may fit on another floppy disk. In our lab, a backup is made only once every other week. When the program purges the negative results, it generates an alphabetized list of the cultures for easy reference.

Several companion programs utilize MICROBE's database. Probably the most clinically useful of these calculates cumulative antibiotic sensitivities of organisms over a given period of time. The program stops at separating the sources into urinary and nonurinary groups, but further subdivisions are clearly possible. Sensitivity statistics compiled over several months allow the detection of changing trends in antibiotic susceptibilities. Most importantly, these statistics provide clinicians with current, local guidelines for immediate presumptive treatment of infections before specific antibiotic susceptibilities are determined.

I am currently developing other enhancements to MICROBE in collaboration with the head of the microbiology department, including capture of College of American Pathologists workload statistics. The present system however, demonstrates that successful, competitive, inexpensive alternatives for hospital laboratory information management are now possible and available.

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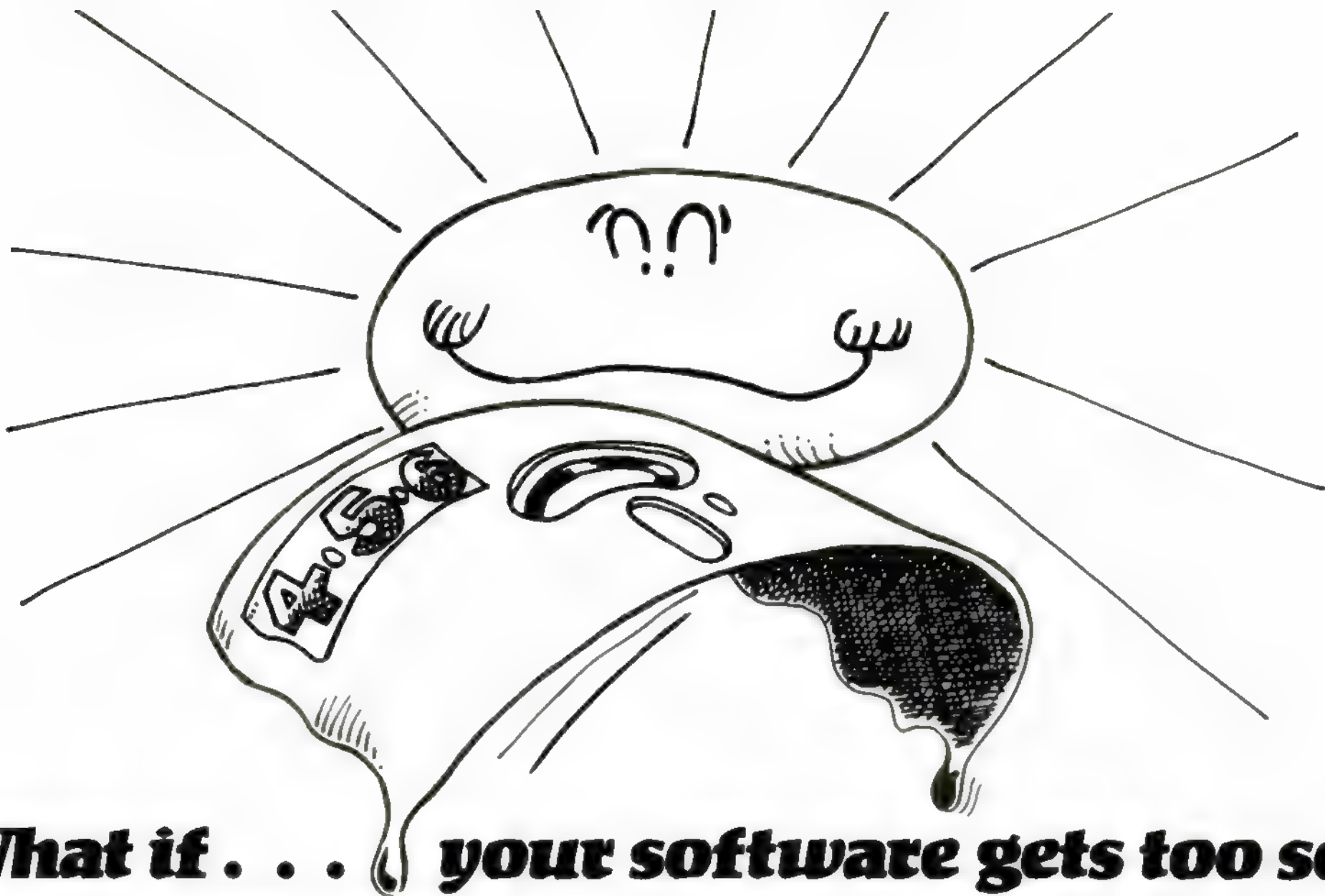
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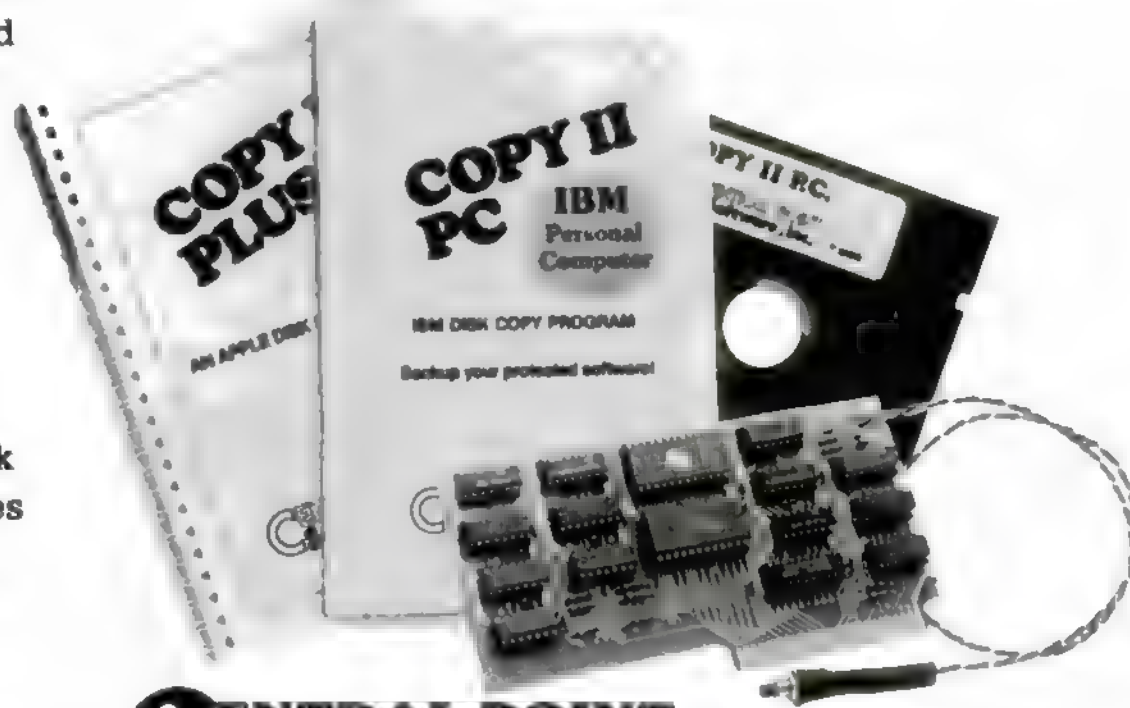
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Keeping Up With the IRS: PC Taxmasters

The investment you make in software for long-term tax planning and tax-form preparation may tip the scales in your favor and bring you a favorable return from the IRS next April.

Thousands of Americans play the great shell game on their 1040 forms every April. As tax brackets creep upward, salary increases and investment profits vaporize: "Now you see them, now you don't." But the fact is that most taxpayers don't take advantage of all the deductions to which they're entitled under the law.

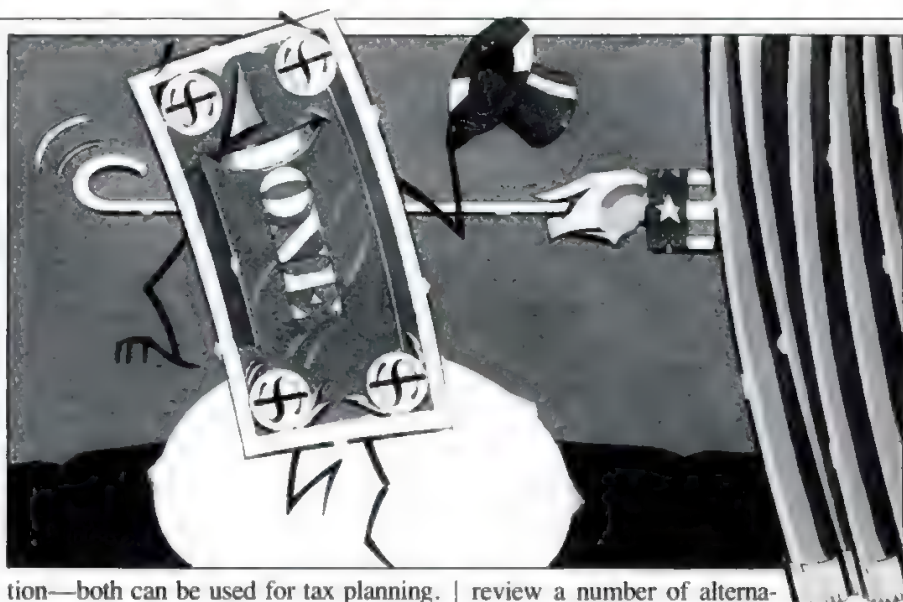
The real measure of your earnings or investment profits is how much you get to keep after taxes are paid. All sorts of tax shelters are available to reduce your yearly tax burden—they range from such exotic interests as cattle investing or box-car leasing to an old standby like real estate.

Personal computer tax programs can help you avoid too many taxes, stay within the intent of the law, and minimize your chances of being audited.

Two Types of Programs

A variety of excellent software is available for federal tax planning purposes and for the preparation of returns. When you select one, be sure that the supplier can provide yearly updates—changes in tax law that could tip the scales in your favor must be included in the program. Usually these updates are worth the additional cost (often about \$50).

Although there are two distinct types of tax programs—planning and prepara-



tion—both can be used for tax planning. The essential difference is that tax planning programs let you view up to 4 consecutive years for comparison purposes. Preparation programs, on the other hand, let you store deductions for the current year, line by line in the forms that make up your return. Anytime a change in your financial status occurs, you can modify an element, recalculate the Form 1040, and watch the effect on the bottom line.

A tax preparation program is useful for evaluating tax liability changes during the year, but it doesn't help if you want to look at how your tax liability will change for future years. This is where the tax planning programs shine. If you need to

review a number of alternative tax decisions over the long term, tax planning programs are the better choice. On the other hand, a preparation program can give you a detailed outlook on your tax burden for the current year.

Tax Preparation

The *HowardSoft Tax Preparer* program (\$295) from Howard Software Services (La Jolla, California) is representative of numerous tax preparation programs. It was designed for individuals who prepare their own returns as well as for professionals who must handle several hundred returns during the tax season. The standard *Tax Preparer* package allows for

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CIRCLE 119 ON READER SERVICE CARD

FINANCE

the completion of 11 forms and 10 schedules. These forms and schedules are prepared directly on the computer display as facsimiles of the actual paper forms you'll send off to the IRS.

Once new data is entered on the appropriate lines, the computer automatically computes and posts results onto other forms and schedules as required. This method allows for fast data entry, error correction, and results preparation. It also makes *Tax Preparer* easy to learn.

For example, you can list specific ele-

When you select a planning program, be sure that the supplier can provide yearly updates to reflect changes in tax laws.

ments of profit or loss from a business or profession on Schedule D as they occur. Investors concerned with tracking their interest and dividend income or capital gains can enter investment return data on computer facsimiles of Schedules B and D, respectively. This makes editing and updating easier. These itemized lists can also be used as supporting statements for the IRS.

Getting It Together

The greatest burden at tax time is collecting all the sales slips, interest notices, mortgage receipts, and the myriad of backup forms you need prior to filling out the tax forms. Tax preparation programs help you make order out of this chaos. They won't keep you from losing your receipts, but they do store the data you need to compute your taxes.

It's a good idea to update your current-year return monthly so you'll have your information in the right place when April 15th rolls around. Even if you hire a CPA

to figure your return, it will work to your advantage to keep records well organized.

Forms and schedules to be printed by the *Tax Preparer* are selected from a menu. They are prepared directly onto either preprinted forms for Form 1040 (as required by the IRS) or a computer-generated format that follows IRS guidelines.

If you're in the tax preparation business, the *Tax Preparer* will maintain an up-to-date list of your clients. You can select the records you want printed, and they will be prepared automatically.

Tax Planning

Two tax programs from Aardvark/McGraw-Hill (Milwaukee, Wisconsin)—the *Personal Tax Planner* (\$99) and the *Professional Tax Planner* (\$350)—allow yearly side-by-side comparisons of the tax effects of one or more situations. The *Personal Tax Planner* is designed for the individual; *Professional Tax Planner* is a more extensive planning program for tax advisers, CPAs, and other tax professionals. Both programs compare up to 4 years of alternatives, print them for review and analysis, or store them on computer disks so you can make future amendments. Although no forms or schedules are prepared, these planning programs are ideally suited for snapshots of multiple-year tax-related activities.

The personal version permits you to analyze the effect of 48 variables on your taxes. These variables fall into ten categories such as filing status and exemptions, adjustments to income, itemized deductions, income averaging, payments, and various taxes and credits.

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Both programs use two tax planning types—the alternative mode and the projection mode. The alternative mode analyzes up to five different tax situations for a single tax year. Each alternative is calculated independently, and the calculations and tax results of one alternative do not affect the results of the other alternatives. You can examine the tax consequences of financial decisions by varying one or more tax items from one alternative to the next.

The projection mode, on the other hand, analyzes a tax situation for an initial year, called the base year, and up to 4 succeeding years. Calculations and taxes in the early years, such as carryovers from capital losses and charitable contributions, are used in calculations for later years. Income averaging information is adjusted from year to year.

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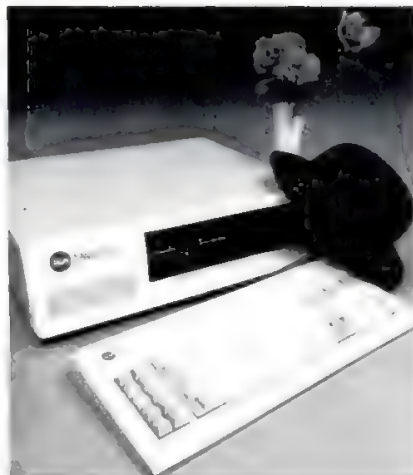
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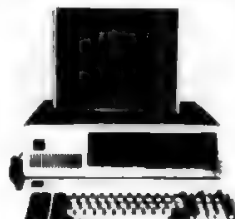


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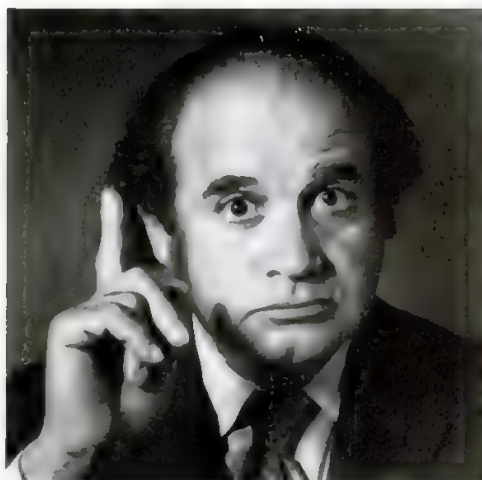
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Insuring Against the Perils of PC

Last issue, the business column brought you a look at micro insurance from a layman's point of view. This issue, PC examines the subject of insurance from a legal perspective.

Now that you've taken the plunge and invested in a microcomputer, it's time to make sure that you have proper insurance coverage. Every owner will want to insure against computer and software damage, and depending upon how you use your micro, you may also need special liability coverage. Choosing among the several forms of special insurance available for your PC can involve all sorts of problems and pitfalls. A brief rundown of your options and opportunities should help make your micro more secure.

Property Insurance

Property insurance (often called "first party" insurance) covers the direct physical losses resulting from fire, flood, and other physical perils. Most common homeowner's policies will cover a personal computer unless it is used primarily for business purposes. If you do use your PC for business, you must look to the specialized market for computer insurance. Also, unlike most standard homeowner's policies, these new computer policies generally cover loss due to power surges.

At least four companies now write special policies just for microcomputers—St. Paul Fire and Marine; Chubb; Shard Morahan & Company; and Safeware. The companies offer essentially identical coverage, but the prices, deductibles, and oth-



er terms will vary. The Hartford also offers similar coverage through an equipment floater endorsement. Most of the new policies are written on a replacement-value basis and will cover all hardware, software, and media.

These new policies usually do not, however, insure data. If you have significant business data storage, you may want to acquire business interruption or "extra expense" insurance to cover the expense of reproducing significant data losses. Some companies provide this coverage through an endorsement or "rider" to their standard policy. The company may also require duplication and separate-site storage for your data—always a good idea.

Be sure to check how your equipment is insured and the proof of loss requirements. For example, some policies require notification of every item of insured equipment *before* a loss occurs. This can be a significant administrative headache for those who often add or exchange peripheral elements. On the other hand, some policies insure all of your equipment up to a certain dollar aggregate without prior notification. You need only present your proof of purchase at the time you make your claim. Of course, you should carefully preserve your purchase documents, preferably in another location.

Make sure you understand what risks are covered under your property policy. Insurers generally offer two basic modes of property risk protection. "Defined risk policies" cover only the specific risks mentioned in the policy. "All-risk" or "blanket" protection policies cover any risk of loss *except* those specifically excluded. Insurers usually charge a lower premium for "defined risk" coverage, but many insureds have learned the hard way that the "defined" risks did not anticipate many common losses.

Although most computer policies are written on an alleged "all risk" basis, the exclusions must be examined carefully. Some policies cover mechanical and electrical breakdowns only if you install specified physical safeguards. If you fail to

implement these "conditions precedent," you may not be covered.

Many insurance companies are primarily interested in the business market where the risk of liability for harm done to others is a major concern. These business insurers offer comprehensive general liability insurance (CGL), plus errors and omissions (E & O) coverage, a kind of computer malpractice policy.

Liability Insurance

These two kinds of insurance are liability policies (also called "third-party" insurance) because they insure the liability of the insured for damage to third parties. The CGL policy is written for businesses to provide coverage for ordinary lawsuits (for example, someone slips and falls on the premises). Special peril insurance can be added where needed (for example, a

manufacturer will add products liability coverage). The E & O policy is designed to protect professional service concerns such as architects, accountants, and lawyers. People in these professions may have any computer-use liability already covered by their current E & O policy. On the other hand, those providing consultation services for computer usage only may need a computer E & O policy. Review this item with your insurance broker.

Every business needs particular coverage. A retail sales store, for example, probably doesn't need E & O coverage, but every business should probably have CGL coverage. The question becomes whether a firm's current CGL coverage is adequate or whether a special computer-oriented policy is needed.

Traditional CGL policies are often inadequate for data processing users

because the coverage language is keyed to "physical injury to or destruction of tangible property." It may not provide coverage for claims involving "intangible" loss arising from loss of data or injuries due to defective software design. Newer policies address this problem by redefining the coverage.

There are three key questions to be reviewed in any liability policy. First, how is coverage defined? Is it claims-made or occurrence? Traditionally, CGL policies and most E & O policies were written on an "occurrence" basis. This meant that the liability carrier would cover any lawsuit that resulted from an "error" that "occurred" during the policy period (usually 1 year with the possibility of annual renewals). But as the potential liability of manufacturers and others expanded so that they might be held liable *today* for "er-

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rors" committed years ago, the insurance carriers turned to a new type of policy—the "claims-made" policy. This type of policy insures against claims made against you during the policy period, no matter when the error giving rise to the claim took place. Thus, you can get coverage for any error committed in the past, no matter how long ago it occurred.

The second key question to ask of a liability policy is, what do the exclusions take away? Some risks simply cannot be covered as a matter of law. In Illinois, for example, you cannot insure yourself for punitive damages that are imposed upon you directly. Vicariously imposed punitive damages can be covered. Of course, if there is an exclusion as to punitive damages, you won't have coverage for either. (Punitive damages are meant to punish the defendant for some egregious conduct.

The logic of the law is that it doesn't make sense to allow the insured to pass the judgment buck to an insurance carrier if the intent is to punish the insured.)

The third key question covers the limits of the coverage and the definition of the deductibles. Give serious consideration to these items. Attorney's fees are always high and in a complicated computer loss incident where there is little case law to help guide the court, costs are likely to be very high. Check to see if the deductible applies to defense costs.

Another common coverage problem concerns the application for insurance. Due to the novelty of computer policies, insurance companies are nervous about the risks they are bearing. Accordingly, the applications for these policies are usually lengthy and detailed. But it is absolutely essential to give accurate informa-

tion on these application forms. Any misinformation, even if inadvertent, could be used by the carrier to disclaim liability.

Conclusions

If you have a significant investment in computer equipment, you should make certain that it is adequately covered from all reasonable perils. If you use your computer for business, you may also face third-party liability exposure and you will want to insure against this risk. Careful review of such exposures with your insurance broker is a must. ■

Paul Cottrell and Barry D. Weiss are both attorneys with the Chicago firm of Fohrman Lurie Sklar & Simon, Ltd. Cottrell concentrates on complex litigation, insurance, and risk management, Weiss on computer law and litigation.

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Courseware Basics

Whether you design, buy, or evaluate educational software, your decisions should be guided by the instructional principles that make good courseware a valuable teaching aid.

Courseware design and evaluation are mirror images of each other. The principles that guide the designer who creates educational software can guide the consumer as well. Whether you buy courseware, design it yourself, or commission others to design it for you, you should be aware of some of the basic components of good courseware.

Using courseware should be as simple as using a book. Books are replete with aids that organize and help learners access information: the table of contents, index, and glossary. Courseware should mimic this convenience—but how? One solution is the menu. Courseware that offers a menu up front does two things: It organizes its activities, and it gives the learner access to them in a stable, consistent way.

With careful programming, a courseware developer can give the menu several other functions. The order of menu entries can recommend or restrict learner selection, which is important if the material must be presented in a specific sequence. A menu that indicates which sections have been completed emphasizes the learner's progress while providing a reminder of what remains.

A menu can orient the learner by creating a gateway into and out of the software's major activities. As a central reference point, the menu helps stabilize the learner and prevent the disorientation that



is rare in books but common in complex software. But the line between the simple and the simply overwhelming is easily crossed. Courseware that offers too many menus burdens the learner's memory with unnecessary options and decision points. Too many options on a menu are equally taxing; five to nine options is a reasonable range. If more choices are absolutely necessary, the menu should be divided into two pages with easy access back and forth. A proliferation of menus makes a statement about the amount of content, indicating, perhaps, that the courseware ought to be divided into separate parts.

No matter how many menus and submenus a program contains, they should

be intelligently organized. When one menu leads the learner to another menu, the option selected from the first menu should become the title for the submenu. Courseware with several layers of menus should offer a shortcut from the lowest level back to the highest.

Serving Suggestions

Students rarely read textbooks from beginning to end; they tend to skip and browse as their interest and understanding dictate. In addition, students often personalize books by highlighting important sections, writing notes in the margins and marking pages.

Courseware, too, should give the learn-

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EDUCATION

er the opportunity to personalize. At the very least, the software should provide the electronic equivalent of a bookmark. One of the unique annoyances of educational software is its habit of forcing the learner to start over each and every time. Menus mitigate this inconvenience, but they usually return the learner only to the beginning of a major section. Ideally the learner should be able to mark and return to the exact spot at which he left off.

The learner should feel in control of the courseware, not the other way around. Generally, a feeling of control means being able to anticipate and understand events on the screen. More specifically, learners should be able to influence such variables as the rate, order, and difficulty level of the information presentation.

Courseware that is too automated can rob the learner of control. Imagine your reaction if you were reading and the pages of your book began to turn themselves. While it's not likely in a book, it's not rare in courseware that uses the timed pause to change or add new information to a display. A timed pause is a programmed guess about how long it will take the reader to understand the material or to reach the end of a paragraph. It is simpler and less surprising to let the reader signal with a keystroke that he is ready for new information.

A variation on the timed pause is flashing feedback—diagnostic messages that twinkle in and out of sight too fast to read but just slow enough to warn you that you've missed something important. Flashing feedback can be more destructive than helpful; information important enough to display should remain on the screen long enough to be read.

An important part of learner control is understanding the input process. Mice and joysticks aside, most learners interact with courseware through keystrokes. This interaction should be consistent: Once the learner is accustomed to pressing the plus key to add text to a display, switching to entering the word *space* is confusing. Similarly, keys should not be assigned multi-

ple functions, such as pressing Enter both to indicate a completed answer and to advance from frame to frame.

In addition, key assignments should be as intuitively sensible as possible. If pressing Shift and the plus key advances you page by page, then Ctrl-+ might advance you chapter by chapter.

Another side of learner control is learner orientation: Make sure the learner knows where he is. Books provide position cues that CRTs lack. The pages of an open book give you a sense of how far you are from the beginning and the end. Courseware can provide similar information by including a header at the top of every frame to identify the current section of the program by title and page number.

The Final Exam

Courseware may be the wave of the future, but it hasn't left the old-fashioned test behind. The final exam and the surprise quiz still threaten many learners. Tests on computers can be even more intimidating than their paper counterparts. Pencil-and-paper tests may not be fun, but at least they are familiar.

Inform the learner that testing is used in the program, possibly by listing it as a menu option. When the learner selects the testing option, an introductory tutorial should anticipate his or her questions and describe what is expected of the learner and what the learner can expect: What kinds of questions are used? How are questions answered—by typing out answers or by selecting a letter? How many questions does the test contain? Is skipping allowed? Is going back over an answer allowed? Is the test timed? What happens if the time runs out?

Considerate courseware tests learners discreetly. Computer-based testing should play down the authoritarian image of the computer by aiming to give the learner at least as much freedom as he or she would have on a paper-based test.

In the next issue I'll discuss more elements of good courseware, including screen layout and diagnostic feedback. ■

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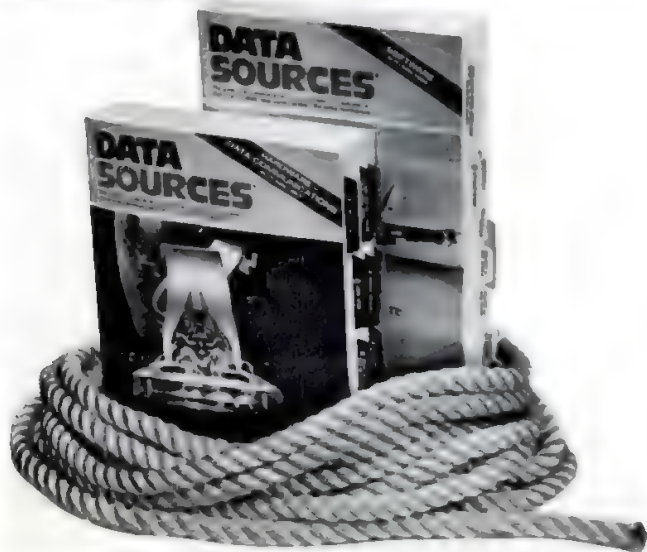
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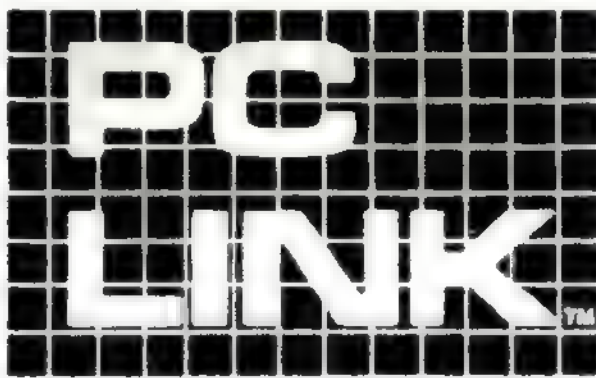
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SERVICE CARD

HiNet/PC Adapter

An adapter board permitting the user's system to link onto the HiNet local area network (LAN) system. The board adds 64K of RAM, a Z-80 microprocessor, an RS-232 serial port, and a HiNet interface to the user's system. The Z-80 microprocessor handles all network interface functions, allowing the user's system to continue independent operations without added overhead.

The Z-80 chip also permits the user's system to run CP/M-80 applications.

Up to 63 workstations and peripherals can be linked together on the HiNet LAN, which can support MS-DOS, CP/M-86, and CP/M software. The LAN

can be configured through the addition of master station options to use from 15 to 184 megabytes of storage capacity and to link with mainframe or ICL-protocol systems.

(List Price: One board, \$495)

Digital Microsystems
1840 Embarcadero
Oakland, CA 94606
(415) 261-1034
TWX: 910-366-7310

CIRCLE 787 ON READER
SERVICE CARD

TeleClerk 20M

A digital sound storage and playback device with the ability to store up to 50 minutes of speech or music on its internal hard disk. Average access to any portion of a recording is 30



RELAX, Synapse Software

milliseconds, permitting the unit to respond to vocal phone inquiries logically. The unit's built-in Z-80 microprocessor permits it to operate independent of the user's system after it has been programmed, freeing the user's computer for other tasks.

TeleClerk 20M includes two standard interfaces: an RJ-11 modular jack for connecting the unit directly to phone lines, and a 9600-bps RS-232 serial port for linking the device to the user's system. Optional interfaces available include a second 300- to 9600-bps RS-232 port or a Centronics parallel port for connecting a printer. Also included within the unit is a real-time clock with battery backup, and an analog/digital voice converter optimized for a 300-3500 Hz effective audio frequency range.

(List Price: \$7,800)

Dialogic Communications Corp.

731 Columbia Ave.

P.O. Box 95

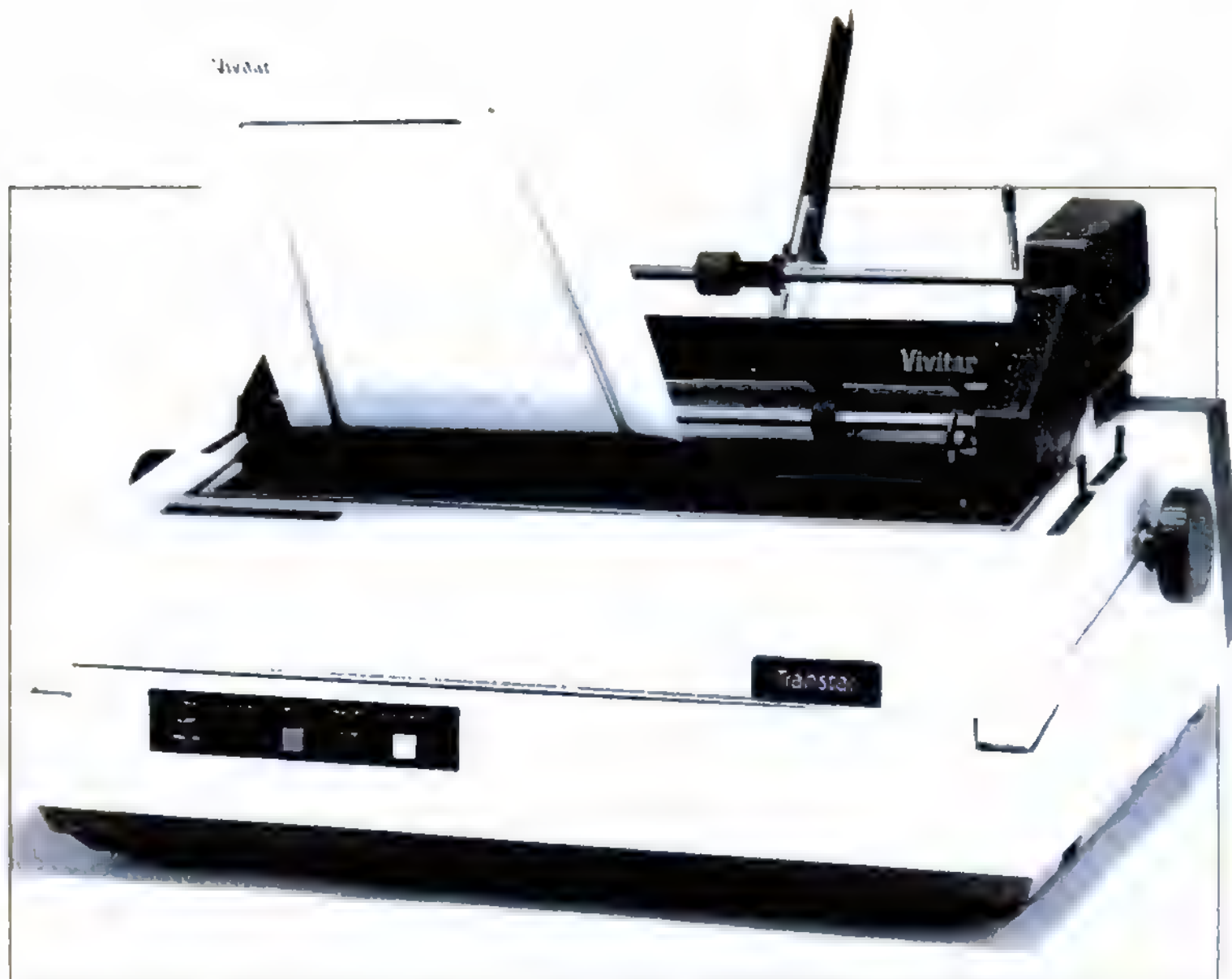
Franklin, TN 37064

(615) 790-2882

CIRCLE 782 ON READER SERVICE CARD

Cut-Sheet Feeder

A line of sheet feeders for a wide range of daisy wheel and other single-sheet printers. The feeders can be attached to a printer in seconds without tools or electrical connections, and can



Cut-Sheet Feeder, Vivitar Computer Products, Inc.

hold up to 200 sheets of paper. Variable paper positioning from 7 to 14 inches allows the printer to use paper in horizontal or vertical positions.

Cut-sheet feeders are available to fit printers from Transtar, C. Itoh, NEC, Diablo, Morrow, Silver-Reed, Televideo, Toshiba, and other manufacturers.

(List Price: \$399)

Vivitar Computer

Products, Inc.

P.O. Box C-96975

Bellevue, WA 98009

(206) 454-9250

CIRCLE 784 ON READER SERVICE CARD

FAXT-96 Modem

An internal modem board providing data transfer rates of up to 9600 bits per sec-

ond over ordinary phone lines. The board plugs into an expansion slot in the user's system, connects to telephone lines with a modular phone jack, and connects to a synchronous communications adapter board via a supplied cable. Features include synchronous half-duplex operation, multiple speed selection, programmable tone generation and detection, and compatibility with CCITT protocols at rates from 300 to 9600 bps.

(List Price: \$1,995)

Gamma Technology, Inc.

2452 Embarcadero Way

Palo Alto, CA 94303

(415) 856-7421

TWX: 910-373-1296

CIRCLE 783 ON READER SERVICE CARD

Universal Programmer, 160 Series

A hardware/software system for programming memory and logic into a range of IC chips. The 160 Series Universal Programmer allows the user to employ software instead of complex hardware to control the algorithms for programming PROMs, EPROMs, EEPROMs, PALs, and IFLs. The system includes a programming station with two zero insertion force sockets—one for 28-pin and one for 40-pin ICs—as well as an interface card that plugs into a spare slot in the IBM PC. Software provided with the system includes *MemSoft*, for programming memories, and *LogiSoft*, for

PAL and IFL logic programming.

The two programs contain all of the necessary programming algorithms and device databases for almost 2,000 device types. The menu-driven programs present the user with a selection of devices and programming operations using easy-to-follow screens. The user enters programming parameters for such programming operations as PROGRAM, READ, VERIFY, CHECK, and QUICK ERASE for EEPROMs. Nonprogramming operations possible with the Series 160 include display/edit, move, fill, save, and load. Most operations can be performed with single keystrokes, and the user is prompted

through the programming process by on-screen instructions in plain English. (List Price: With MemSoft only, \$4,995; with both packages \$5,495) Valley Data Sciences Inc. 2426 Charleston Rd. Mountain View, CA 94043 (415) 968-2900

CIRCLE 783 ON READER SERVICE CARD

Formwriter 2

A desktop laser page printer capable of producing up to eight full pages of letter quality business forms per minute. The unit incorporates 256K RAM to store fonts, logos, and signatures, allowing multiple fonts to be printed on the same line. Using a dry electrographic print process, it prints in a 300 x 300 dots per inch



VP-6802P Plotter, Panasonic Industrial Co.

matrix, producing high-quality images, excellent graphics, and dense black solids.

All of Formwriter 2's printing process components are housed in a single user-replaceable cartridge; the cartridges are rated at 2,000 copies each and are available in black, blue, and brown print colors. Paper trays hold single-sheet 17 to 21 lb. bond paper, overhead transparency foils, and label sheets.

The printer's required *Forms Management* software provides a directory of forms, fonts, logos, and signatures stored on the PC's disk. The software supports up to 125 different fonts, logos, or signatures, and up to 1,000 different forms. The printer and software both form one part of a complete forms processing system marketed by the manufacturer.

(List Price: Formwriter 2, \$5,000; Software, \$1,000) Sprinter Division

Computer Language Research, Inc. 2395 Midway Rd. Carrollton, TX 75006 (214) 934-7000

CIRCLE 785 ON READER SERVICE CARD

VP-6802P Plotter

A single-pen plotter with a writing speed of 18 inches per second, capable of drawing plots over an area up to 10.2 by 14 inches. The unit stores eight pens in a rack along one edge of the drawing surface, which can be chosen by the drawing arm under software control. The unit is also capable of unattended operation by using a chart advance option.

The VP-6802P is available with a parallel, GP-IB, or RS-232 serial interface. (List Price: \$3,200) Panasonic Industrial Co. One Panasonic Way Secaucus, NJ 07094 (201) 348-7183

CIRCLE 786 ON READER SERVICE CARD



Formwriter 2, Computer Language Research, Inc., Sprinter Div.

Video-5

An add-on board permitting users of the Cubicomp CS-5 solid-modeling system to videotape created images. Video-5 synchronizes the display generator of the CS-5 system with an external video signal so that, with the addition of a sync generator and color encoder, high-quality graphics images can be recorded onto all standard video formats.

Video-5 allows users to record images in either U.S. (NTSC) or European (PAL) standard formats, on VHS, Beta, Umatic, and Type C videotape formats.

(List Price: \$900)

Cubicomp Corp.

3165 Adeline St.

Berkeley, CA 94703

(415) 540-5733

CIRCLE 774 ON READER
SERVICE CARD

COLORMAX

A multidisplay board for the IBM PC/XT, permitting simultaneous connection of a monochrome and a color monitor to a single card.

Features of the board include dedicated connectors for RGB and monochrome displays, an RCA jack for composite monitors, and on-board light pen circuitry.

Choice of display can be selected under software command, and the board permits custom definition of character sets. A parallel interface is available as an option.

(List Price: Standard version, \$499.95; with parallel interface, \$559.95)

Micromax

6868 Nancy Ridge Dr.

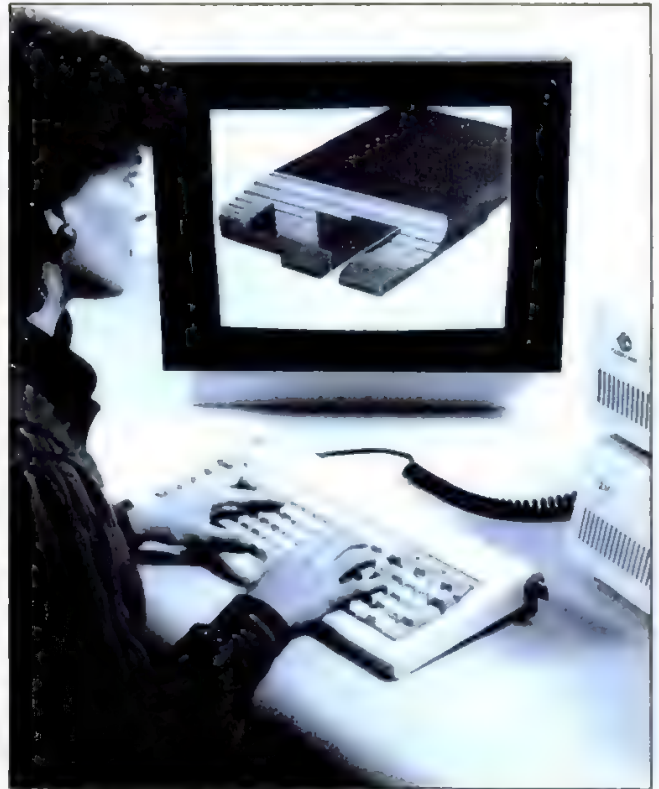
San Diego, CA 92121

(619) 457-3131

CIRCLE 761 ON READER
SERVICE CARD

SOLO

A training system consisting of a control console that is placed on-line between the user's system printer port and a special audio/digital cassette player, and proprietary training software. The system audibly and interactively guides the learner through the use of such



Video-5, Cubicomp Corp.

software as Lotus' 1-2-3, BASIC, dBASE II, Multiplan, and Wordstar.

The SOLO training software synchronizes the audio tape presentations to the screens presented on the user's system, providing audio reinforcement of the lessons and hands-on practice sessions. Correct and incorrect responses are acknowledged by the system, and help is given as needed. In total, the SOLO system is designed to emulate a self-paced, one-on-one student/instructor learning environment.

(List Price: Console and cassette player, \$169;

training packages, \$129 each)

Learning Automation Inc.

183 Guggins Ln.

Boxboro, MA 01719

(617) 264-4040

CIRCLE 779 ON READER
SERVICE CARD

FiXT

A plug-in ROM chip that provides a hard boot capability to the IBM PC for several add-on hard disks. With FiXT, the IBM PC can be booted from Davong, Datamac, Great Lakes (Pegasus), Percom, and Zobex hard disk systems. Plugged into the unused ROM socket of the



SOLO, Learning Automation Inc.

PC's motherboard, the chip provides a BIOS interface between the PC and the hard disk device.

FiXT allows the use of standard PC-DOS 2.0 disk partitioning and formatting facilities, and incorporates built-in diagnostics.

(List Price: \$70)

Golden Bow Systems

P.O. Box 3039

San Diego, CA 92103

(619) 298-9349

CIRCLE 762 ON READER
SERVICE CARD

DMS-816 Workstation

A diskless terminal for use with the HiNet local area network (LAN). The terminal features twin microprocessors (a Z80B and an 8088), allowing PC-DOS, CP/M-86, and CP/M soft-

ware to be run on the LAN; a built-in PC-mapped monochrome display; and an enhanced PC-compatible 94-key keyboard. Also featured are three ports—one RS-232 serial, one Centronics parallel, and one port to link the unit to the HiNet LAN.

(List Price: \$1,695)

Digital Microsystems

1840 Embarcadero

Oakland, CA 94606

(415) 261-1034

TWX: 910-366-7310

CIRCLE 775 ON READER
SERVICE CARD

SOFTWARE

Term/Difference Illustrator

A program for insurance professionals, capable of preparing presentation quali-

ty printouts comparing any term insurance (including modified 21 Whole Life) with any cash value insurance plan (including Universal Life and RLR). The comparison allows the prospective insurance buyer to invest the difference at any rate of interest, showing on the bottom line whether the term with the difference invested or the cash value policy is better suited to meet particular needs. The user may enter dividends for both policies and enter dividends to reduce premiums for the permanent plan.

The software's screens consist of a simple question-and-answer format to produce term conversion illustrations from existing files. Any company's rates and values for either of the policies being compared can be used.

The printouts show the agent's name, client's name, both insurance company names, all annual premiums, dividends, difference at interest, cumulative totals, summary, and bottom line conclusions.

(List Price: \$29.95)

Requires: 64K RAM, one disk drive, PC-DOS, 80-column printer.

ACS Software

Publishing Co.

3255 Wing St., #330

San Diego, CA 92110

(619) 223-5331

CIRCLE 789 ON READER
SERVICE CARD

The Report Writer Jr

A word processing program designed for the IBM PCjr. The program creates files that can later be read and edited on a standard PC with any ASCII file word processor.

The Report Writer Jr provides full-screen editing capabilities with such features as block moves, copy, delete, as well as find only or find and replace options. It takes advantage of all PCjr keyboard editing functions such as Page Up, Page Down, Insertion, and Deletion.

(List Price: \$80)

Requires: 128K RAM, one disk drive, PC-DOS 2.1.

Monument Computer
Service

Village Data Center

P.O. Box 603

Joshua Tree, CA 92252

(619) 365-6668

CIRCLE 792 ON READER
SERVICE CARD

Patient Recall System

A medical appointment-scheduling program that can generate and print out patient recall cards automatically. The software employs a system of menu-driven prompts to lead the operator through all phases of initial installation, operation, and report generation. By maintaining a complete patient file including name, address, previous visit date, and other data, *Patient Re-*



DMS-816 Workstation, Digital Microsystems



Expense Account Manager, Adaptive Software

call can generate the recall cards in response to the elapsed time interval entered by the operator.

The software can print 4 × 6-inch continuous cards approved by the U.S. Postal Service. It can support approximately 35,000 patient files on a 10-megabyte hard disk drive.

(List Price: \$395)

Requires: 64K RAM, two disk drives, PC-DOS, 132-column printer.

Arctic Data Corp.

1839 First Ave.

Prince George, B.C.

Canada V2L 2Y8

(604) 562-5240

Telex: 047-7132

CIRCLE 763 ON READER
SERVICE CARD

Expense Account Manager

A program designed specifically to organize and track travel and entertainment expenses. Features include easy entry and correction of expenses, reminders of expenses often overlooked, and prompts for specific information required by the

IRS and corporate budget forecasts. For individuals who must charge out their expenses to a particular client or project, the software provides an option for sub-totals by user-defined criteria. A table of frequently traveled trips is maintained to allow consistent reporting of automobile mileage.

Expense Account Manager automatically reconciles travel advances and tracks reimbursements, providing several reports for this purpose. An interface to Lotus' 1-2-3 is included for more complex manipulations of accumulated travel data. The system can also print out pocket recording sheets that can be used to record expenses as they are incurred for later entry into the system.

(List Price: \$150)

Requires: 128K RAM, one disk drive, PC-DOS.

Adaptive Software

1868 Cavell Ave.

Highland Pk., IL 60035

(312) 831-4420

CIRCLE 782 ON READER
SERVICE CARD

PC/FOCUS

An implementation for the IBM PC of the *FOCUS* mainframe database management system. *PC/FOCUS* combines an English nonprocedural language for queries, reporting, graphics, and financial modeling, with advanced database management facilities.

Also included with the software is Table Talk, a window-driven natural language interface based on artificial intelligence techniques. This facility enables novice users to report requests without keyboard typing. Table Talk visually assists the user through a series of static and pop-up screen windows that cover all phases of report creation. The last window offers the user a choice of immediate

execution of the report requested on the PC or on a linked mainframe system, or storing of the request for later execution.

Other facilities offered in *PC/FOCUS* include Link, a communications module enabling bidirectional data transfers between *PC/FOCUS* and mainframe *FOCUS* at up to 9600 bps, and *DIF FILES*, for writing data files in the Data Interchange Format used by many spreadsheet programs.

(List Price: \$1,595)

Requires: 512K RAM, 5 MB hard disk, PC-DOS 2.0.

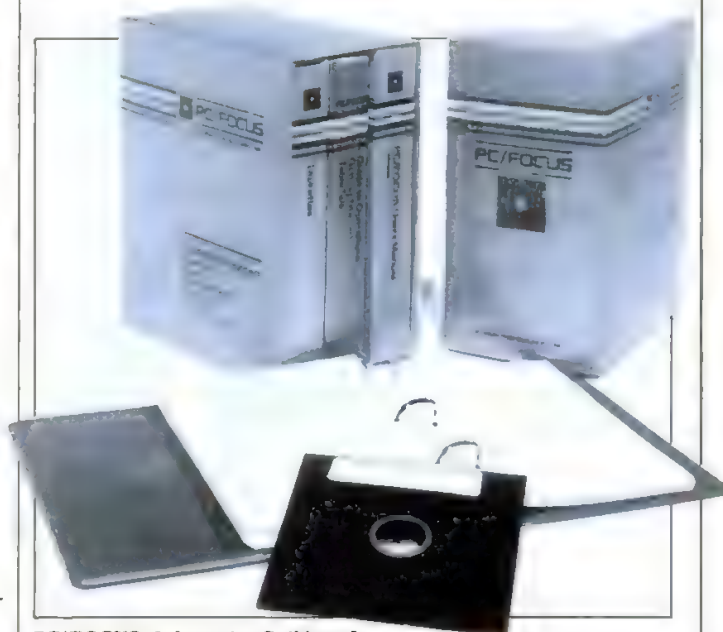
Information Builders, Inc.

1250 Broadway

New York, NY 10001

(212) 736-4433

CIRCLE 783 ON READER
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PC/FOCUS, Information Builders, Inc.

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If something you would like is not listed, just call. If we don't have it, we can get it.



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ESI-CALCULATOR

An arithmetic calculator program with memory on/off switch, printer on/off switch, and accumulation up to 999,999,999. The program also includes allowance for up to seven decimal places and an on-screen "tape" display.

(List Price: \$15.95)

Requires: 96K RAM, one disk drive, PC-DOS.

Esi Software Inc.
110-80 Chippewa Rd.
Sherwood Pk., Alberta
Canada T8A 3Y1
(403) 467-5174

CIRCLE 791 ON READER
SERVICE CARD

B. Writer, French Version

A French translation of the *B. Writer* word processing program. The software, designed as an introductory system, includes features such as character and line insertions/deletions, block moves and deletions, automatic line centering, right margin justification, word wrap, and an on-line help screen. *B. Writer* is also equipped with print options including underlining, emphasized print, compressed print, double-wide print, as well as a facility for chaining files together during printing.

The French version was prepared by DORTEC, a Denmark software firm. Included with the program is its BASIC source code,

which permits the advanced user to alter features and customize the program to suit specific needs. A compiled version with better execution speed is also available.

(List Price: \$39)

Requires: 64K RAM (128K for compiled version), one disk drive, PC-DOS.

Automated Information Systems
1503 Ave. J, #203
Lubbock, TX 79401
(806) 762-6604

CIRCLE 786 ON READER
SERVICE CARD

Salvo Information Manager

A relational database management system that can import data directly from DIF format programs for further

manipulation using a wide range of DBMS capabilities. *Salvo* offers an English-like inquiry language for searching data files and producing on-screen or printed reports, and a separate command language for developing data file-oriented applications. While *1-2-3* maintains data lists individually, *Salvo* coordinates and concatenates lists, defining relationships between lists and developing reports based on those relationships. A special "view" mode can graphically depict the available data files and the ways in which they are related.

Salvo's English-like natural language inquiries are made from its "request"

mode; a typical inquiry might read "List all salespersons with their customers and any orders by amount." Alternatively, *Salvo's* separate command language permits the creation of complex program files that manipulate data files as needed for an application.

The software also offers a menu-driven mode, allowing users to choose modes with single keystrokes.

(List Price: \$495)

Requires: 128K RAM, two disk drives, PC-DOS.

Software Automation, Inc.
14333 Proton Rd.
Dallas, TX 75234
(214) 392-2802

CIRCLE 784 ON READER
SERVICE CARD



Salvo Information Manager, Software Automation, Inc.

SOFTWARE

Mailer

A standalone mailing list program for U.S. and Canadian mail. The program offers users a predefined database, label formats (1, 2, or 3 across), and fill-in-the-blank screen forms. It can be used with other programs such as *dBASE II* and *WordStar*, reading in existing address files and creating ASCII files for merging into letters. Capabilities of *Mailer* include extensive sort, scan, search, address file merging, record purging, and record selection.

(List Price: \$150)

Requires: 128K RAM, one disk drive, PC-DOS.

Maurizi Associates
1344 Fitch Way
Sacramento, CA 95825
(916) 486-2993

CIRCLE 780 ON READER
SERVICE CARD

CROSSDATA

An operating system converter program that can convert data/text file disk formats from CP/M to MS/PC-DOS and back again. Two modes of operation are available to the user. The first uses function menus with explanations of commands and status line information. The second mode uses a command line format for the more experienced user. *CROSSDATA* has formatting criteria data for 30 popular 5¼-inch disk formats that can be updated.

The program features six



CROSSDATA,

Award Software, Inc.

modes for converting files on a disk:

- Selected CP/M to host DOS;
- Host DOS to selected CP/M;
- Selected CP/M to host CP/M;
- Host CP/M to selected CP/M;
- Selected CP/M to selected CP/M;
- Selected DOS to selected DOS.

The selected disk format can be any format that *CROSSDATA* has in its disk

type selection menu.

Through the use of split-screen software, both the source and destination file directories can be displayed on the screen simultaneously. Two file selection modes are included, one using the cursor for direct file selection from the on-screen directories, the other using wild-card options and/or path name commands to route files.

(List Price: \$99)

Requires: 64K, two disk drives, PC-DOS 2.0.

Award Software, Inc.
236 N. Santa Cruz Ave.
Los Gatos, CA 95030
(408) 395-2773

CIRCLE 778 ON READER
SERVICE CARD

Maintenance Master

A maintenance and facilities management program for the IBM PC/XT. The software allows the user to input facilities data, monitor equipment maintenance, coordinate equipment replacement, track labor and material costs, generate management reports, and highlight excessive maintenance costs.

Maintenance Master, written in *dBASE II*, consists of three modules: *Preventive Maintenance*; *Planning, Scheduling, and Control*; and *Inventory Control*. The software incorporates the *dBASE II* RunTime facility and can interface with *dBASE II* to provide extended reporting capabilities.

Features of the complete system include report functions and special methods of identifying and tracking each piece of equipment within a facility.

(List Price: \$1,995)

Requires: PC/XT; 256K RAM, 10 MB Hard Disk, PC-DOS 2.0.

Penton Software, Inc.
420 Lexington Ave., #2846
New York, NY 10017
(212) 878-9630

CIRCLE 774 ON READER
SERVICE CARD

SOFTWARE

Printer Graphics

A graphics print program designed for use with letter quality impact printers. The software can produce presentation quality bar graphs and pie charts with such printers as NEC, Qume, Diablo, and other impact printers with a graphics mode.

The software features a facility for reading title and data directly from Data Interchange Format (DIF) files created by a number of spreadsheet programs, including Lotus' 1-2-3 and VisiCalc.

(List Price: \$75)

Requires: 128K RAM, one disk drive, PC-DOS 2.0, letter quality printer.

Cedar Lakes Software
9235 E. Harry, #20
Wichita, KS 67207
(316) 682-3168

CIRCLE 776 ON READER
SERVICE CARD

BLAST

An asynchronous communications program providing bidirectional full-duplex operation, allowing the user to receive one file while sending another. The menu-driven program supports unattended operation, can capture text or binary files emulating asynchronous ASCII terminals, and can invoke user-defined log-on sequences with a single keystroke.

BLAST (BLocked ASynchronous Transmission) maintains noise-free

communications over phone lines, satellite links, packet-switching networks, and direct-connect local area networks. The protocol used by the software continuously interleaves unit blocks of data with check and acknowledgement blocks in



Printer Graphics, Cedar Lakes

Software

both directions, speeding transmission times. It operates through RS-232 serial ports and async modems and can work from port to port over a direct connection at speeds up to 19.2K bps. (List Price: \$250)

Requires: 64K RAM, one disk drive, PC-DOS, async modem.

Communications Research Group, Inc.
8939 Jefferson Hwy.
Baton Rouge, LA 70809
(504) 923-0888

CIRCLE 773 ON READER
SERVICE CARD

Overhead Express

A business graphics program for producing overhead transparencies and foils. The software includes four different typefaces (Modern, Script, Popular, and Classic) in both roman and italic type styles and in

serif output files. Once printed using a dot matrix printer, acetate transparencies can be produced with most common photocopiers.

The various printers supported by the software include the Epson FX/MX line, Hewlett-Packard Ink-Jet, C. Itoh, and Okidata products as well as the IBM graphics printer.

(List Price: \$195)

Requires: 192K RAM, two disk drives, PC-DOS, printer.

Business & Professional Software, Inc.
143 Binney St.
Cambridge, MA 02142
(800) DIALBPS
(617) 491-3377

CIRCLE 771 ON READER
SERVICE CARD

Keyprint

A printer configurator program for use with Epson MX, RX, and FX dot matrix printers. The menu-driven program offers over 20 options for setting the printer's operation, including double strike, compressed print, italics, and other character sets.

(List Price: \$59.95)

Requires: 64K RAM, one disk drive, PC-DOS, Epson printer.

Softkey Software Products, Inc.
2727 Walsh Ave.
Santa Clara, CA 95051
(408) 986-8148

CIRCLE 767 ON READER
SERVICE CARD

five different point sizes. Also included are international characters and graphic symbols such as arrows, brackets, check marks, and so forth.

Overhead Express provides 12 fill-in-the-blank templates to aid in the creation of a complete business presentation. These templates for generating customized pages include a title page, a bulleted list of items, a comparison chart, a table, and a budget. Presentations can be produced from existing word proces-

EZdBASE & dREPORT

Two utilities for use with the *dBASE II* database management program. *EZdBASE* is a file and screen generator capable of automatically generating *dBASE II* program and format files from screens or menus "drawn" on the screen by the user. All 256 ASCII characters supported by the IBM PC can be used in creating screens, as well as highlighting, reverse video, and underlining effects.

EZdBASE allows the user to specify up to 64 data entry fields on each screen generated by creating two data files for the application. After finishing a screen, the utility prompts the user for field names and other file structure information, then automatically generates the necessary code to create the application's format files. In addition, the utility includes a *dBASE II* command structure permitting most *dBASE II* functions to be selected from a menu.

dREPORT is a report-writing utility for *dBASE II* that can automatically draw data for a report from two separate files without joining the files. The user can generate single- or multiple-line reports with up to 40 fields from the two .DBF files. Features include support for automatic pagination and adjustable page

widths, lengths, headers, and footers. Up to nine selection criteria can be set, with eight adjustable break levels, in selecting the data to be included within a report.

(List Price: \$100 each; demo disks \$20)

Requires: 128K, two disk drives, PC-DOS, *dBASE II* Version 2.4.
Automated Office Systems
4160 Club Dr.
Atlanta, GA 30319
(404) 237-9420

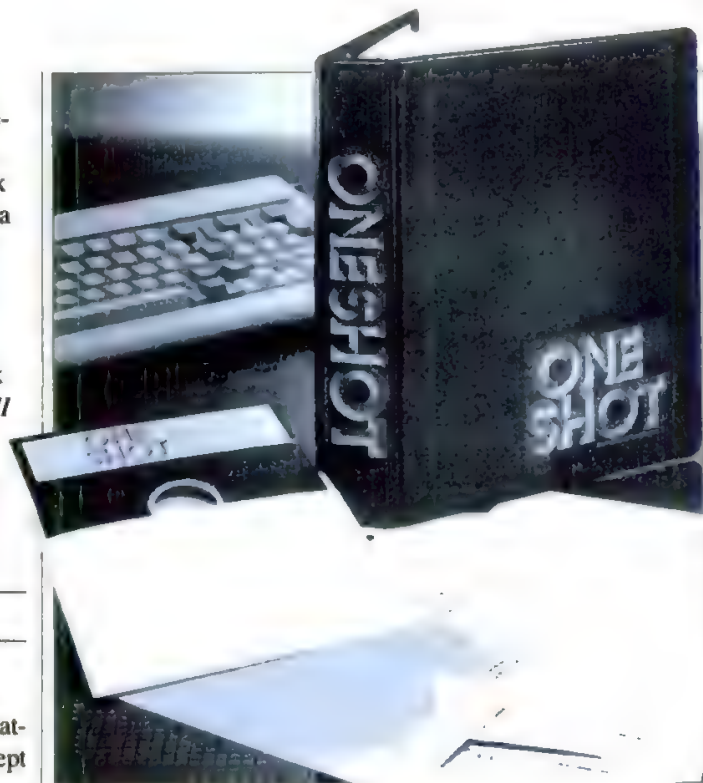
CIRCLE 769 ON READER SERVICE CARD

OneShot

A data selecting and formatting program that can accept data in a wide range of forms and make it accessible to such applications as *dBASE II*, Lotus' 1-2-3, *VisiCalc*, and other programs.

OneShot can accept data from mainframes, public access systems, other microcomputers, time-sharing systems, and so on, in the form of reports, queries, or straight data files. It converts the input into the form needed by the user through the use of templates. It can accept data arriving via communications programs such as *SMARTCOM*, *PC-TALK*, *ASYNCR*, or directly in the form of disks.

The program learns to read/interpret the input data, recognizing headers, footers, delimiters, subtotals, and other data parameters.



OneShot, DataViz, Inc.

OneShot then saves whatever it has learned, translating it into a template. This simplifies the production of identical reports on a regular basis with only minor template modifications.

(List Price: \$195)

Requires: 128K RAM, one disk drive, PC-DOS.

DataViz, Inc.
P.O. Box 1319
Norwalk, CT 06856
(203) 847-7724

CIRCLE 772 ON READER SERVICE CARD

dB>MENU!

A front-end driver program for *dBASE II*, providing menus that accomplish basic tasks with a minimum of programming knowledge on

the part of the user. Instead of the standard *dBASE II* dot prompt, the user is presented with an informational screen showing the file in use, index key fields, the number of records in the file, and the current record number. Through menus, the user can CREATE, APPEND, BROWSE, EDIT, INDEX, FIND, SORT, and access other *dBASE II* command functions using single-keystroke commands. The software is expandable, providing basic routines to support the use of custom-designed *dBASE II* applications.

dB>MENU! is part of a Software Primer series that also includes two training/

reference manuals for learning *dBASE II*, Version 2.4.

dBASE II Level 1 starts a user in creating a database and continues through the creation of simple command files. The appendices at the end of the manual provide an alphabetical listing of command syntax examples, and an explanation of how to send printer control codes to a printer.

dBASE II Level 2 demonstrates the programming capabilities of the database management system with a step-by-step guide through which users write their own programs. Areas covered include the use of logical conditions, the MACRO function, and custom data entry screens. The three appendices cover ASCII character codes, the SET commands, and *dBASE II* utilities.

(List Price: *dB>MENU!* \$34.95; Manuals \$34.95 each)

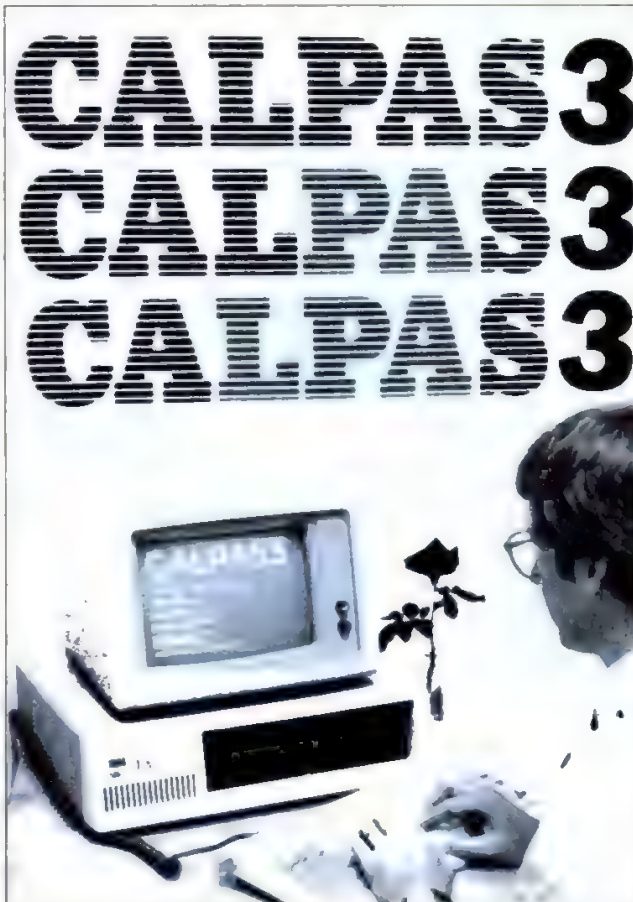
Requires: 128K RAM, two disk drives, PC-DOS, *dBASE II*.

JNZ, Inc.
729 Windward Dr.
Rodeo, CA 94572
(415) 799-1446

CIRCLE 764 ON READER
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Barrios E-Com System

A program allowing the user to access and transmit messages via the U.S. Postal Service's Electronic Mail (E-Com) network. The basic



CALPAS3, Berkeley Solar Group

program consists of three components: an E-Com message generation module, a print module, and the transmission module. The basic package allows the user to utilize the three types of messages accepted by the Postal Service (text insertion, common text, and single address messages). The print module can print out texts exactly as the Postal Service will and incorporates an error detection facility for verifying formatting of messages for E-Com.

The advanced version of the *Barrios E-Com System* includes the basic program, a Text Insertion Message Generator (*TIMGEN*), and an Address Formatter. These two additional modules will reformat any existing ASCII data file into a transmission file containing any number of Text Insertion Messages (*TIM*) or an address list to be used by the Postal Service for an E-Com mailing.

Both versions use full-screen menus and are set up

in a step-by-step format for preparing messages to be sent to the E-Com network. (List Price: \$395)

Requires: 128K RAM, two disk drives, PC-DOS, async communications card.

Barrios Technology, Inc.
16902 El Camino Real
Houston, TX 77058
(713) 480-1889

CIRCLE 768 ON READER
SERVICE CARD

CALPAS3

A program for determining the heating and cooling requirements of houses and small commercial buildings. The IBM PC version, based upon the original mainframe software, uses a full-year hourly simulation to calculate energy performance.

CALPAS3 is certified by the California Energy Commission as complying with the California Title 24 building energy code. (List Price: \$795)

Requires: 256K RAM, two disk drives, PC-DOS, 8087 IC chip.

Berkeley Solar Group
3140 Grove St.
Berkeley, CA 94703
(415) 843-7600

CIRCLE 775 ON READER
SERVICE CARD

Warehouse Master

An inventory management program for distribution warehouses. The menu-driven program enables users to sequence orders to be filled and to track the activity of

specific items in inventory. The software is written in *dBASE II*, incorporating the RunTime module.

The program can track items by specific lots or expiration dates, updating inventory records immediately. It incorporates ten different reports, including Consolidation, Stock Replenishing, and Warehouse Utilization.

(List Price: \$1,995)

Requires: PC/XT: 64K, 10 MB Hard Disk, PC-DOS. Penton Software, Inc. 420 Lexington Ave., #2846 New York, NY 10017 (212) 878-9617

CIRCLE 777 ON READER SERVICE CARD

Medical Transcriber PCjr

A medical records reporting program for the IBM PCjr. The program, designed to work with the producers' more comprehensive diagnostic and records management systems, allows users to read, edit, and print medical records from the patient's master diagnostic file. It is intended to permit branch offices or physicians away from the office to access patient records conveniently at any time.

Medical Transcriber PCjr can work with either the producers' *Medical Office Management PCE* or *Medical Office Management PCHE* packages. It stores all diagnostic and treatment

data, permitting rapid searches of common symptoms or prescribed drug conflicts. The free-form design of the system allows doctors to make notes much as they might on a patient's chart record.

(List Price: \$249.95)

Requires: IBM PCjr: 128K RAM, one disk drive, PC-DOS 2.1, CMA medical management system, host IBM PC.

CMA Micro Computer 55722 Santa Fe Trail Yucca Valley, CA 92284 (619) 365-9718

CIRCLE 765 ON READER SERVICE CARD

Universal Accounts Receivable

A menu-driven file program for the PC-XT combining time payment, balance forward, open item, and monthly rental account types into a single system. Customer account information is accessible for inquiry or

change using either the account number or portions of the customer's name. The software automatically earns Rule of 78 interest on time payment accounts and provides for service charges optional by customer on balance forward and open item type accounts.

In addition to reports typical of each category of accounts, tax liability reports are provided for state, county, and city. The *Universal Accounts Receivable* program is designed to simplify the accounting problems encountered when a user's customer base includes clients whose tax status varies depending upon point of purchase and delivery.

(List Price: \$2,500; demo \$25)

Requires: PC-XT: 128K RAM, hard disk, PC-DOS, 132-col. printer.

Utility Computing Service, Inc. P.O. Box 4419

Monroe, LA 71211 (318) 388-0922

CIRCLE 770 ON READER SERVICE CARD

PUBLICATIONS

How To Manage Your Small Computer

A handbook for novices, exploring the most common pitfalls of owning a personal computer. Drawn from the experiences of members of the Association of Computer Users, *How to Manage Your Small Computer Without Frustration* features a workbook format with 13 sequential worksheets on potential trouble spots such as site location, supplies and accessories, safety and maintenance, and special Consumer Alerts and Case Histories.

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Warehouse Master, Penton Software, Inc.



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book, designated IMC-136, is indexed and features an easy-to-follow format with important terms printed in boldface with illustrations. (List Price: \$20)
International Information Management Congress
 P.O. Box 34404
 Bethesda, MD 20817
 (301) 983-0604

CIRCLE 763 ON READER SERVICE CARD

BASIC Programming with the IBM PCjr

A BASIC primer written especially for the novice user of the IBM PCjr. Author David C. Willen provides programming hints and sample programs the user can enter and run. As each new BASIC language concept is introduced, emphasis is placed upon its applicability for programming a wide range of applications.

A separate diskette with all BASIC programs listed in the book is also available.

(List Price: \$12.95; with disk \$24.95)
Howard W. Sams & Co., Inc.
 450 Newport Center Dr., #200
 Newport Beach, CA 92660
 (714) 720-1824

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2. Releases should be typewritten double-spaced on one side of the paper. Copies of advertisements for the product may be included, but in most instances we need more information about a product than is typically included in an ad.
3. Include telephone contacts for marketing and technical questions.
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ized mailing lists for virtually any category of recipient. Mailing lists from Compu-Mail can be cross-referenced for test marketing purposes or geographic considerations.

Compu-Mail also offers clients a computer graphics creation service for creating customized forms, for such purposes as direct-response advertising, invoice and purchase order forms, survey questionnaires, and newsletters.

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BASIC Programming with the IBM PCjr, Howard W. Sams & Co., Inc.

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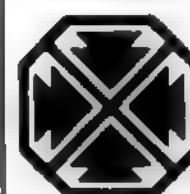
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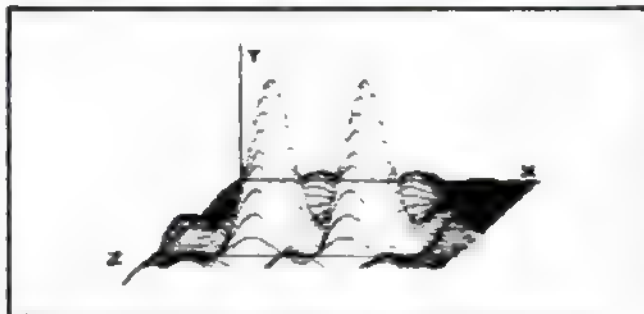
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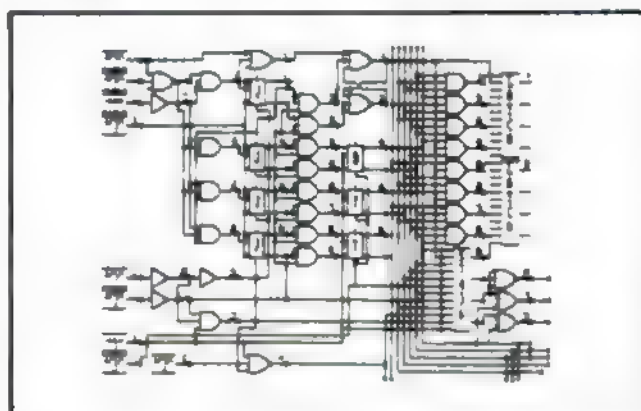
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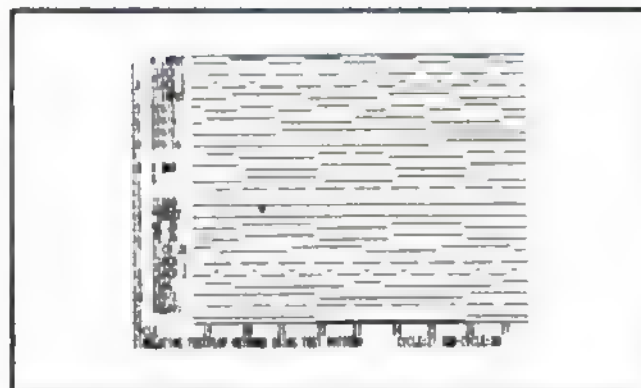
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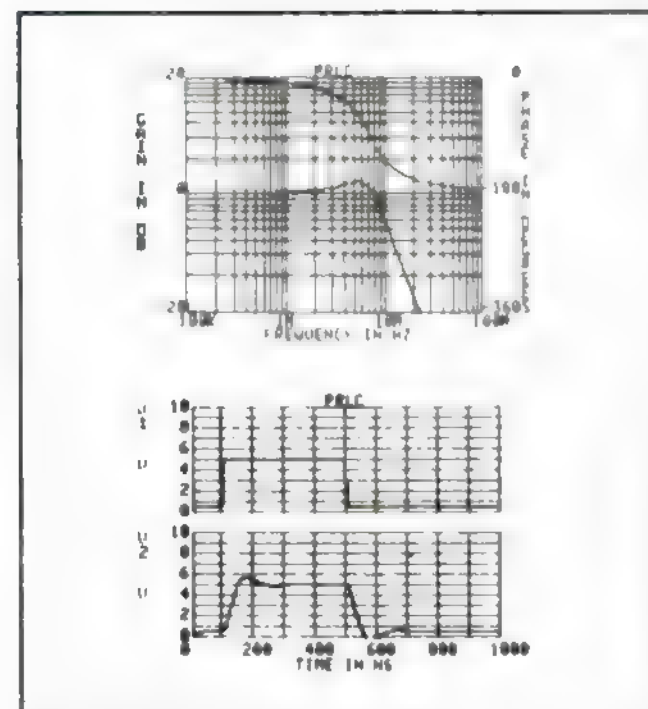
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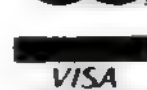
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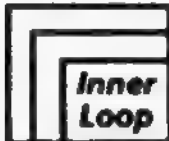
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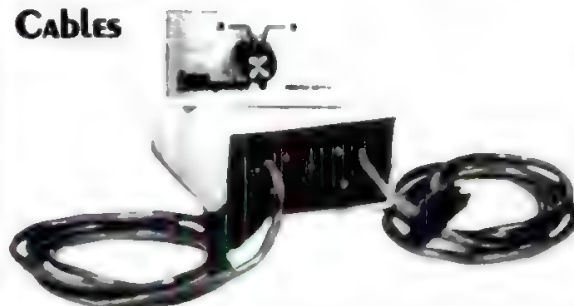
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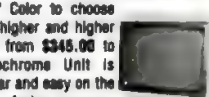
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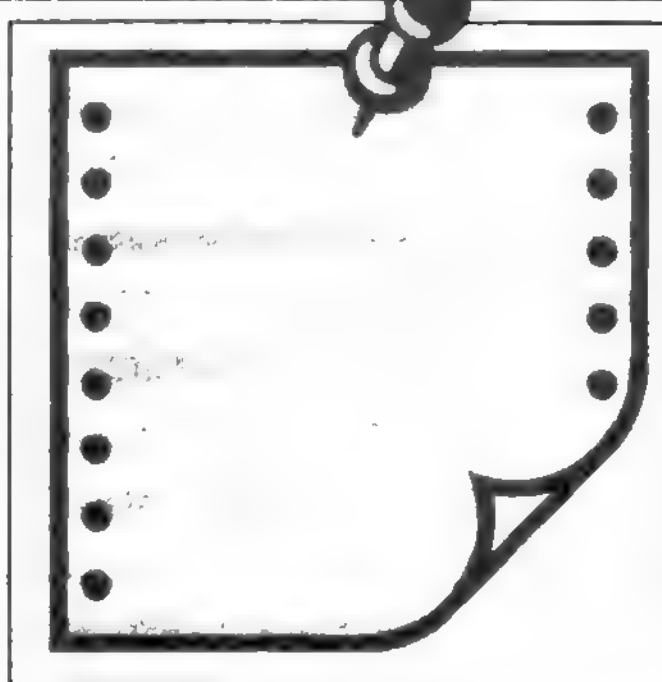
User Group Status Report: IBM Support

The first reviews of IBM's PC User Group Support program are turning out to be mixed, and the level of participation has not been overwhelming. But don't count out IBM yet.

The first judgments are now coming in on IBM's implementation of user group support. This program consists of a monthly newsletter, a user group phone line, and a bulletin board system (see "PC User Groups: IBM Signs On," *PC*, Volume 3 Number 11). The phone line and bulletin board system are available for use by club officers. These officers collect questions directed to IBM and other user groups and also distribute the information provided by this service.

The newsletter, the *EXCHANGE*, is distributed once a month on a double-sided diskette. It is mailed directly to user group presidents. The IBM User Group Support Department's literature indicates that "the newsletter is intended for the exchange of technical information about IBM Personal Computer products." The department recommends that it should be freely distributed to the members of the user group. Probably the best way to do this is to place it in the group's software library. Selected articles could be reprinted in the club's own newsletter. You could reprint the entire *EXCHANGE*, but this would take quite some time and consume a large quantity of paper. A printout of a single copy of the first issue of the *EXCHANGE*, for example, created a stack of paper $\frac{3}{8}$ of an inch high.

The newsletter features graphics, sound, and a liberal application of the spe-



cial function keys. A PC with a graphics adapter will display attractive artwork and play lively music at the beginning of each major section of the newsletter. The *EXCHANGE* also provides function key assignments for help, page, sound, previous, next, print, run, demo program (if available), and exit operations. This kind of thoughtfulness is typical of the human engineering provided by most IBM software.

Phone Line

The user group support phone line is a (usually) human-answered communications link between user group officers and IBM's User Group Support Department. It operates from 8 a.m. to 5 p.m. Eastern Standard Time, Monday through Friday (except holidays). As it is answered, each

call is verified by a request for the caller's name, user group affiliation, and user group office title. If no one can answer a call, a message is taken and a staffer returns the call as soon as possible.

The support package of information that IBM provides to user groups states: "By limiting the use of this phone line to user group officers, we hope to minimize the number of busy signals and keep the line open for calls."

It is important to understand that IBM does not intend to answer technical questions on this phone line. According to the support literature, "IBM offers other services for this purpose." Instead, the phone line can provide answers to questions about user group activities, give information on how to contact other user groups, help with general questions about other user groups and about IBM products and services, take requests for IBM materials and services, and answer questions about IBM user group support programs. It also claims to offer assistance in forming new user groups. This is a bit of a paradox, though, since you have to be a user group officer to gain access to the phone number in the first place.

Bulletin Board

IBM's user group bulletin board is available for use 24 hours a day, 7 days a week. In addition to providing the type of

CLUB NEWS

information available over the phone line, the bulletin board allows for the exchange of technical hints and tips about IBM PC products. Clubs can also exchange information about their activities. A contact list of registered user groups is available on the bulletin board.

Users

Initially, I thought it would be easy to find people who have used the support program. As I started interviewing user group officers coast-to-coast, however, I quickly learned otherwise. Only a limited number of people had accessed the bulletin board or phone line, and a number of user group officers indicated that they weren't at all sure if they ever wanted to use these services.

When asked his opinion of the user group support program, for example, Bennet Landsman, president of the Philadelphia Area IBM PC Club, indicated he had received the material but had looked only at the newsletter. Bennet says, "It's good for a start. I personally didn't get any more out of it than I do from the newsletters we exchange with clubs all over the country."

Bennet said that IBM will have to learn and evolve. "It would be nice if they sponsored regional meetings around the country for user group officers." IBM tried this at the West Coast Computer Fair and, with any luck, more meetings will be planned.

Dick Carr, president of the Greater Reno Operating Group, complained that he had called the user group support office in Boca Raton and followed it up with a letter. To this day he hasn't received an answer.

These are just a few of the comments I heard in discussions with user group officers. Most clubs just don't seem to be using the support system. A number of factors account for this neglect, including insufficient publicity, lack of faith in the support being provided, and complete apathy about the service altogether.

But perhaps the greatest user group

concern is IBM's use of a "you pay the toll" phone line. All phone charges for the user group support services are the responsibility of the user group, and IBM will not accept collect calls. Of course, IBM does pay for any return calls it has to make. Almost all of the user group officers I talked to objected to IBM's policy and felt that a toll-free 800 number should have been provided. IBM's justification for its procedure is that it keeps the amount of time spent on the line to a minimum. The less time each caller spends on the line, the more calls can be accepted. As a user group officer, I believe the lack of a toll-free number is not a major drawback.

The toll-free line can cause problems, however, if you try to access the bulletin board through a long-distance telephone service that uses lower-grade telephone lines. I tried this and ended up wasting my money. Approximately 50 percent of the characters were garbled and the bulletin board was unusable. Of course, this was my error, not IBM's. Rather than trying to save a few bucks on the call, it's a good idea to access the board through the highest-quality telephone lines available.

Personal Experience

My first exposure to the phone line came on a day when IBM was making a new product announcement. As usual, the announcement came on a Tuesday. Since I was interested in finding out about one of the new word processing packages, I called the phone line to ask some questions. The phone rang a couple of times, and I was greeted with a recorded message. It told me to identify myself and leave a phone number where I could be reached. I was expecting this, since Gene Barlow, manager of User Group Support, had informed me in an earlier interview that if a meeting were in progress an answering machine would take a message and someone would return the call. I was sure that most of his staff were attending the new product announcement that afternoon. I did not expect, however, that it would take until the following Friday to

have my call returned. Making matters worse, the individual who returned the call said that he hadn't had time to look over the particulars on the announcement, and that I would see the information in the next *EXCHANGE*. Basically, I got zero return on my investment of a long-distance phone call.

The bulletin board has its own problems. Once on the system, you are asked some identification questions and then given some options from a menu. I tried to browse through the mail area for messages left on the bulletin board, but immediately found out that this system doesn't allow you to scan messages unless they are addressed specifically to you. This defeats the purpose of a bulletin board system. If a club officer left a message regarding an error found in a software package or some hardware problem, it would be useful to allow that message to be viewed by everyone. I hope IBM changes this procedure in the near future.

I would rate the bulletin board as only fair. Many local bulletin board services are far easier to access than the one provided by IBM. The IBM board's options seem more limited than those on many public domain RBBS programs.

Only time will tell if the IBM's user group support program will become a success, but I tend to be optimistic. Although many problems need to be worked out, given IBM's vast resources, I'm sure the company will be able to solve them to the satisfaction and benefit of most user groups. ■

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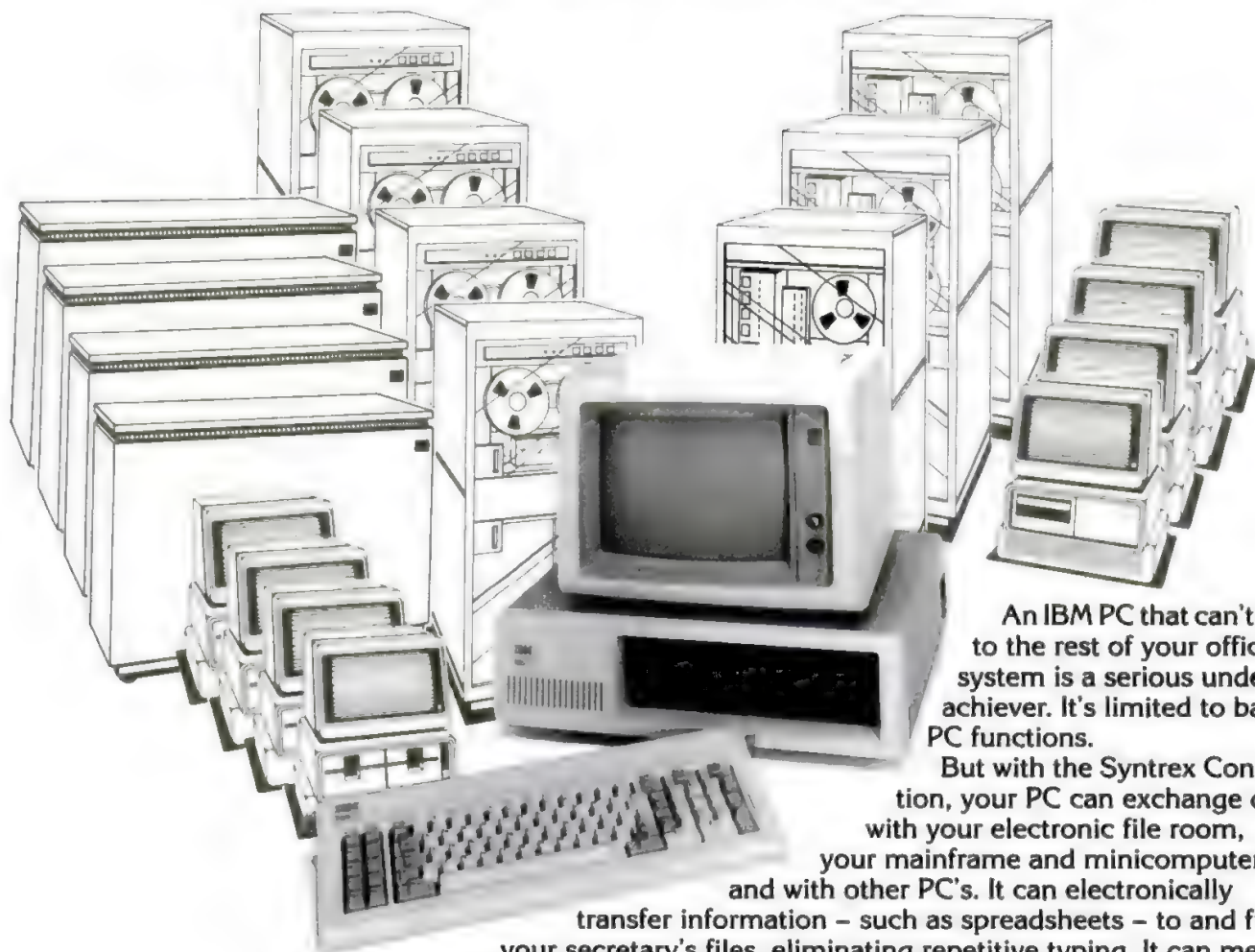
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Tips on dBASE II

Making the most of dBASE II's power is not always easy. But a few simple techniques can help turn you into a pro.

As a long-time user of *dBASE II*, I am a bit surprised at some of the command files (run-time applications) that have been written and published by both experienced programmers and novices. I suspect that most users' difficulty with such software stems from its often rather forgettable documentation; some commands are poorly explained, while others are not touched on at all.

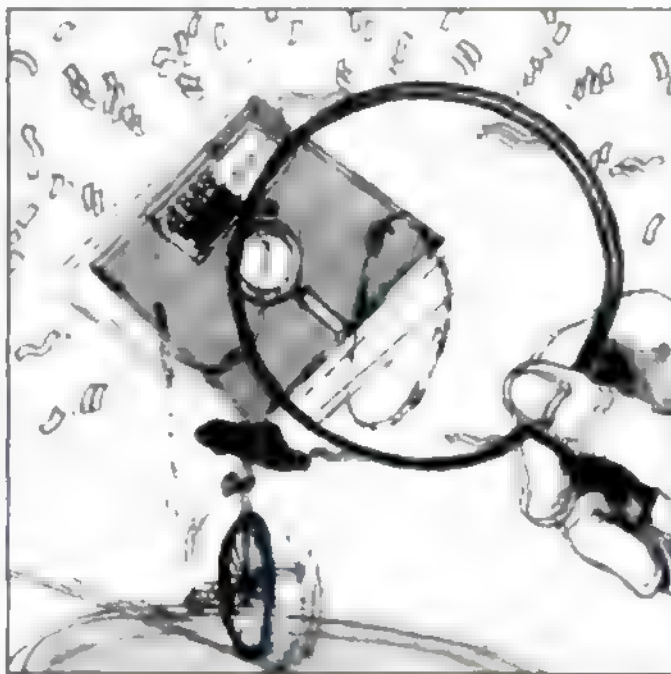
Beginning in this article, and continuing in the next issue, I'll attempt to describe a few techniques that may benefit many *dBASE II* users and help clear up this problem. I'll start with a discussion of how to write more compact command files.

Writing Tight Code

The simplest way to save keystrokes when writing a command file involves initialization of memory variables. Say you want to initialize character variables M:NAME, M:ADDR1, M:ADDR2, and M:ADDR3. Assume that M:NAME is of length 15, and the other three are of length 30.

Instead of writing the contents of Figure 1, you can save keystrokes and minimize the possibility of miscounting blanks by replacing the last three lines with the following code, all on one line:

```
STORE m:name+m:name
```



```
TO m:addr1,m:addr2,m:addr3.
```

Many people test for a condition only to assign T or F to a logical memory variable. For example, instead of writing

```
IF m:prsc='PRINTER'
  STORE T TO m:print
ELSE
  STORE F TO m:print
ENDIF
```

you can accomplish the same result with the following single line of code:

```
STORE m:prsc='PRINTER' TO
m:print
```

Or, instead of writing

```
WAIT TO ok
STORE !(ok) TO ok
```

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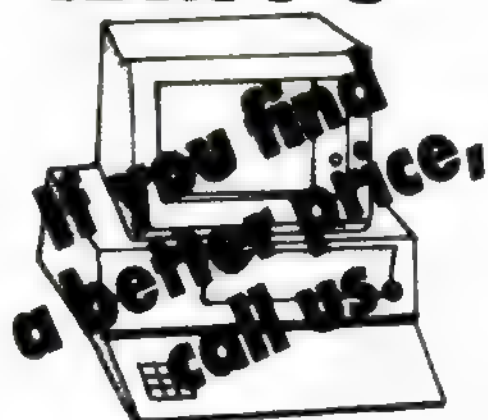
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PROGRAMMING

IF ok='Y'

or writing

WAIT TO ok

IF ok='y' .OR. ok='Y'

you could write the shorter

WAIT TO ok

IF ok\$'yY'

As another example, say you have a command file that has a series of REPORT FORM commands. You want to give the user a chance to specify the destination of the report (screen or printer) before each REPORT FORM command is issued. Instead of asking the user each time and then having an IF-ENDIF loop such as

```
IF printer
  REPORT FORM report1 TO PRINT
ELSE
  REPORT FORM report1
ENDIF printer
```

it seems better to include a menu selection that a user selects only when he wants to change the destination of the reports. This selection could assign either of two values to a memory variable, say

```
STORE ' ' TO select
```

designating the screen as the report destination or

```
STORE 'TO PRIN' TO select
```

making the destination the printer.

Then, any FRM file can be invoked

with the one-line command

```
REPO FORM report1 &select
```

The Report Form Command

The REPORT FORM command of *dBASE II* is the easiest way to produce a decent report out of the database currently in use. It also provides proper word wrapping for text strings that are allocated a narrow column width.

Some users are always faced with the problem of wanting to display more data than can be normally accommodated on an 80- or 132-column page. For example, suppose that the following fields were contained in a database:

NAME	TYPE	WIDTH
EMPLOYEE	C	20
ADDR1	C	25
ADDR2	C	25

It's easy to get *dBASE II* to write the above three fields in one field column with a report layout like this:

```
EMPLOYEE NAME
STREET
CITY, STATE ZIP
```

to produce reports like this:

```
John A. Smith
123 Main Street
Rockville, MD 20850
```

by responding to *dBASE II*'s prompt dur-

```
STOR ' ' TO m:name
STOR ' ' TO m:addr1
STOR ' ' TO m:addr2
STOR ' ' TO m:addr3
```

Figure 1: A listing showing the "long" way to initialize memory variables.

```
COL      WIDTH,CONTENTS
001      25,employee+' '+addr1+addr2
ENTER HEADING:<EMPLOYEE NAME;STREET;CITY, STATE ZIP;=====
```

Figure 2: Code showing how to wrap column headings in REPORT mode.

PROGRAMMING

ing the FRM file creation with the code in Figure 2.

The trick here is to pad any field shorter than the specified column width with enough blanks to force a word wrap to the next line. The < in the heading, of course, left-justifies the text of the heading.

The REPORT FORM command can

dBASE II does not handle arrays like traditional high-level languages do.

also be used to generate free-form reports without any column headings, page numbers, or dates. For example, if you just wanted a simple report such as:

```
John A. Smith,  
123 Main Street,  
(301) 123-4567
```

all on one line, you could specify something like the contents of Figure 3. (Note that no heading is specified.) The REPORT FORM command is then invoked with the PLAIN option.

No Asterisks

When I write a command file, I always begin the file with a half page to a page of comments that constitute a brief documentation of the system. This block of comments includes a description of all files used by the system (DBF, FRM, NDX, and so on). I include the structure of all databases used. I obtain this information from *dBASE II* via the LIST STRUCTURE command, and I capture it into a disk file via the SET ALTERNATE command. The disk files are included in the command file with the Ctrl-KR command of my favorite text editor, *WordStar*.

To turn the lines into comments, I could go through the laborious (even with *WordStar*) task of inserting an asterisk on each and every line. But there is a much easier way; I merely surround the block of

comments with an IF impossible and ENDIF statement as in Figure 4.

The block of text in the IF-ENDIF block is ignored because IF impossible always yields a false value, for the same reasons that a DO WHILE T loop is always executed because it actually means DO FOREVER.

Handling Arrays

Unfortunately, *dBASE II* does not have a facility for handling arrays like traditional high-level languages do. BASIC, for example, has the DIM statement and an array index facility. Most users emulate array handling by assigning the elements of a string array to one long memory variable. For example:

```
STORE 'JanFebMarAprMayJun  
JulAugSepOctNovDec' TO  
months
```

(all on one line). Any month can then be extracted from the variable MONTHS, by the substring function \$.

I handle arrays using *dBASE II*'s macro facility. For example, the BASIC loop

```
FOR I=1 TO 9  
PRINT LINE$(I)
```

NEXT I

can be written in *dBASE II* as

```
STORE 1 TO I  
DO WHILE I < 10  
STORE STR(I,1) TO ichar  
? line&ichar  
STORE I+1 TO I  
ENDDO WHILE I<10
```

Variable Length Records

My consulting organization uses an electronic filing cabinet program, FILE-CAB3, that we wrote completely in *dBASE II*. This program allows us to retrieve documents obtained from hard-copy documents via an optical character reader, and abstracts created using a text editor or entered via the keyboard under control of the program. The document abstracts are, of course, of varying length. We handle this by keeping a secondary database that maintains pointers to the abstracts database. The ABSTRACT database has only one field:

```
LINE,C,77
```

(setting the length at 77 allows space for the colons in an 80-column screen during

```
COL      WIDTH,CONTENTS  
001      80,employee-', '+addr1-', '+phone  
ENTER HEADING: <cr>
```

Figure 3: A program to generate a free-form report without column headings.

```
IF impossible  
  
CAC.PRGM (c) 1983 Darwin Systems, Inc.  
DATE WRITTEN: 12/12/83  
PURPOSE: This command file ...  
  
DBF USED:  
  
DBF STRUCTURE:  
  
...  
  
ENDIF impossible
```

Figure 4: A demonstration of how to use a logical test to insert comments without asterisks into a *dBASE II* program.



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PROGRAMMING

data entry). The ABSTRKEY database, which is in the secondary region, maintains pointers to the primary database. Its structure is

```
KEYWORDS, C, 77
BEGIN, N, 5
END, N, 5
```

The BEGIN and END fields contain the record numbers in the primary database that pertain to a keyword or set of keywords.

Fixing a Database Structure

dBASE II performs updates in place during an APPEND or EDIT operation, but it is not religious about updating the DBF header record (containing the count of the number of records in the database) at every opportune turn. An outdated header record can also result from power interruptions. The inevitable result is the error message "RECORD OUT OF RANGE."

Fortunately, fixing the DBF record count is a simple matter once you understand that the count is the second and third byte (expressed in hex, least significant byte first) in the DBF file. For example, if there are 780 records in the database (hex equivalent 030C), the second and third bytes in the DBF file should be 0C and 03, respectively.

Normally, the header record can be fixed with the following *dBASE II* commands:

USE badfile

COPY TO temp

The COPY command causes the correct number of records to be written to TEMP.DBF. Later, you can simply rename the TEMP file to your original database name or USE TEMP and copy it back to the file.

Alternatively, you could physically change those two bytes in the DBF file with DEBUG. The problem with this approach is that DEBUG and the DBF file must fit in available memory. For very large DBF files, you can use the BASIC program in Figure 5 to make the change.

So far, I've covered how to write tight code in command files, make the most of the REPORT FORM command, use extensive comment lines without asterisks, handle arrays with macros, and fix database structures. In the next issue of *PC*, I'll take a shot at explaining how to automatically invoke a command file and how to unload a database in comma-delimited form for use by programs such as *MailMerge*, *DataStar*, and various BASIC programs. ■

P. L. Olympia is a scientist with a doctorate in chemical physics whose hobby is computers. He is president of Darwin Systems, Inc., a Gaithersburg, Maryland, computer consulting firm. He is chairman and magazine editor of the SAS International Micro Users' group and operates a bulletin board and software exchange system at (301) 963-6894.

```
10 'DBFIX.BAS to fix number of records in a DBF file
20 ' Patch suggested by Ashton-Tate
30 INPUT "Enter (in CAPS) fully qualified name of DBF file";badfile$
40 OPEN "R",#1,badfile$,3 '3 is record length, default=128
50 FIELD #1,1 AS dummy$, 2 AS recnum$ 'Alloc space in rdm buff
60 GET #1,1 'Read record into random buffer
70 PRINT "Old number of records is ";CVI(recnum$)
80 INPUT "Change to what number";goodnum%
90 ' Convert number and move data into random buffer
100 LSET recnum$=MKIS(goodnum%)
110 PUT #1,1 'Write the record back
120 SYSTEM
```

Figure 5: A BASIC program that will repair damaged *dBASE II* file headers.

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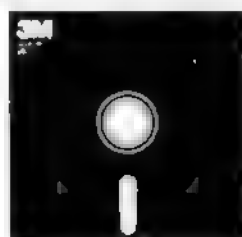
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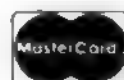
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EDITED BY PAUL SOMERSON

User-to-User

PC readers use this forum to help one another by passing along their questions, solutions, comments, and complaints.



TREE Is Tops

Recently, while compiling a program, I was surprised to see a Disk Full error message. What made this message unusual was that I was using an XT. While it's true that 10 megabytes isn't really all that much space (the equivalent of a mere 28 360K floppies), now that Tallgrass and others are pushing svelte 70-meg units (National Memory offers half a gig—watch for a review in an upcoming issue), I really filled this XT up fast.

One of the reasons is that since old reliable WordStar 3.3 can't handle paths, you either have to stick its 92K on every subdirectory, or do all your editing on its one subdirectory and keep swapping text files back and forth. The rumored next incarnation of WordStar will no doubt support paths; MicroPro's fine new CorrectStar spelling checker uses them.

If you edit with a word processor such

as WordStar that generates automatic backup (.BAK) files, you'll soon find your disks littered with old backup versions of your files you really don't need any longer. It's pretty simple to wipe them all out by typing:

DEL *.BAK

but this works only on the disk or subdirectory you're currently logged into. It doesn't save all that many keystrokes, but I have a batchfile called BAK.BAT with that one line in it. I just tap in BAK and the dross vanishes. If you have an XT, you can end up with dozens of .BAK files scattered across forty or fifty subdirectories. It's a genuine pain to have to find every subdirectory, log into it, erase the extraneous files, find the next one, log into it, and so on, unless you have a way of doing it automatically.

The batch file KILLBAK.BAT in Figure 1 will do this all for you, if you're using DOS 2.0 or 2.1. To run this file, you have to have KILLBAK.BAT, BAKCLEAN.BAS (see Figure 2), TREE.COM, and BASICA.COM all on the drive you want to tidy up. (You can use BASIC, but I erased it a long time ago. BASICA does everything BASIC does, and it takes up only a bit more space, so why bother with a less versatile version?)

If any of these four files is missing, the batch file will tell you so, and stop working. If they're all there, however, it will run TREE.COM, which lists all the directory paths on your drive, then redirect the

USER-TO-USER

```

rem ***** This will delete all *.BAK files on your disk
pause **** Hit Ctrl-Break if you want to quit before deleting any files!
rem ***** Don't worry if you see "File not found" messages -- that's normal
echo off
if exist TREE.COM goto bascheck
echo on
rem PUT TREE.COM ON YOUR DISK AND START AGAIN
echo off
goto bye
:bascheck
if exist BASICA.COM goto bakcheck
echo on
rem ***** PUT BASICA ON YOUR DISK AND START AGAIN
echo off
goto bye
:bakcheck
if exist BAKCLEAN.BAS goto start
echo on
rem ***** PUT BAKCLEAN.BAS ON YOUR DISK AND START AGAIN
echo off
goto bye
:start
echo on
rem ***** CREATING LIST OF SUBDIRECTORIES . . .
echo off
TREE %:BAKDEL.FIL
echo on
rem ***** STRIPPING OUT EXTRANEOUS CHARACTERS . . .
echo off
BASICA BAKCLEAN
echo on
rem ***** ERASING ALL *.BAK FILES IN ALL DIRECTORIES . . .
rem ***** Remember, it's normal to see "File not found" messages !!
echo off
ERASEBAK
:bye

```

Figure 1: Main KILLBAK.BAT batch file.

```

100 ' BAKCLEAN.BAS -- This file reads the BAKDEL.FILE
110 ' created by redirection of TREE.COM, then writes
120 ' subdirectory names to third file for DEL *.BAK
130 OPEN "BAKDEL.FIL" FOR INPUT AS #1
140 OPEN "ERASEBAK.BAT" FOR OUTPUT AS #2
150 INPUT #1, A$
160 IF LEFT$(A$, 5) <= CHR$(10) + "Path" THEN 180
170 PRINT #2, "DEL "; RIGHT$(A$, LEN(A$) - 7); "\" + "*.BAK"
180 IF NOT EOF(1) THEN 150
190 PRINT #2, "DEL *.BAK"
200 CLOSE
210 SYSTEM

```

Figure 2: BASICA BAKCLEAN.BAS file that reads the redirected TREE.COM output and generates a batch file called ERASEBAK.BAT.

output of TREE into another file called BAKDEL.FIL (Figure 3). It will then load and run a BASICA program, called BAKCLEAN.BAS.

BAKCLEAN looks at the file created by the redirected TREE, strips out everything but the paths (with their accompanying backslashes), and creates another file, called ERASEBAK.BAT, that will do the actual erasing. It then returns to DOS.

Since the batch file is still in control, DOS executes ERASEBAK (Figure 4), which goes into every directory and sub-

directory one-by-one and deletes any file with a .BAK extension. You can adapt this technique to do similar tasks that require snooping in every subdirectory. Just change the BAKCLEAN.BAS file to create a batch file that contains the DOS commands you want.—P.S.

DOS Redirection Bug

The KOPY.BAT file presented in a recent "User-to-User" column (PC, Volume 3 Number 8) is not only very useful, but illustrates an interesting bug in DOS 2.0.



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Path: \U2U\U2U1
Sub-directories: None

Figure 3: Sample redirected TREE.COM BAKDEL.FIL output.

```
DEL \PROJECT\*.BAK
DEL \DBASE\*.BAK
DEL \TALK\*.BAK
DEL \CALC\*.BAK
DEL \TEMPU2U\*.BAK
DEL \U2U\*.BAK
DEL \U2U\U2U2\*.BAK
DEL \U2U\U2U1\*.BAK
```

Figure 4: Sample ERASEBAK.BAT contents.

After keying in this file and using it a few times, I noticed that the destination disk of every disk that was backed up contained a new file called PUT. Using the DEBUG utility to examine this file disclosed that it contained a single character followed by an ASCII carriage return and line feed.

After copying a few more disks and examining the PUT file, it became apparent that the character was whatever I happened to enter in response to the "Strike any key when ready . . ." prompt. On a hunch that DOS was interpreting the right cursor key in line four as a redirection

command, I changed the line to read "pause ==> Insert a new, formatted disk in the A: drive." Sure enough, now I was getting a new file called Insert on the destination disk. Curiosity satisfied, it was a simple matter to change the "==" to "****" and solve the problem. Apparently DOS 2.0 is not smart enough to treat everything following a pause command as a remark.

Charles W. Rowland
Richardson, Texas

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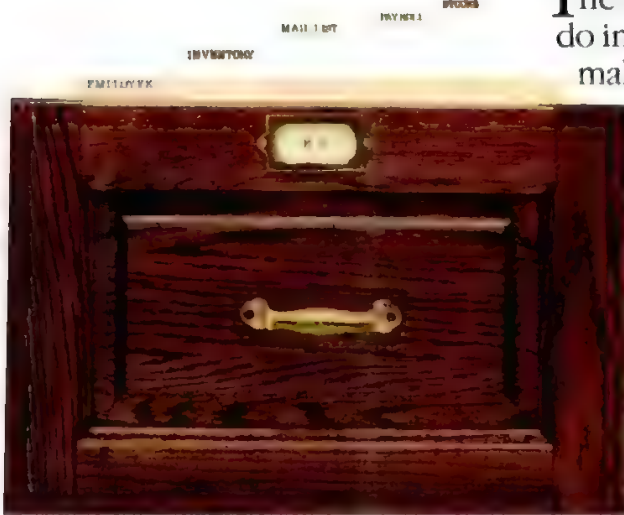


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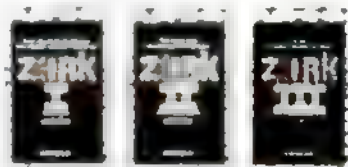
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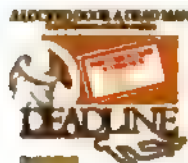
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MARK ZACHMANN

PC Tutor

Midnight Driver

Q: In "DATE Strikes Out at Midnight" (PC, Volume 3 Number 8, page 414), a reader pointed out a bug in PC-DOS 2.0.



The problem with the DATE routine is that dates aren't always changed when the midnight hour passes.

You said that a new clock driver program is needed to fix the problem. Such a clock driver is available as a piece of public domain software, called CLOCK-FIX.SYS, which is offered through many IBM PC user groups and remote bulletin board services (RBBS) around the country. One source is the bulletin board that I operate, the RBBS of the SIG/M SAS Users Group International, a system with many free public domain programs available 24 hours a day. Its telephone number is (301) 963-6894.

Once you have a copy of this clock driver, install it by adding this line to the CONFIG.SYS file:

DEVICE=CLOCKFIX.SYS

P.L. Olympia
Gaithersburg, Maryland

A: Remote bulletin boards can be treasure-troves of routines for solving specific problems that have plagued you for

months. Readers are welcome to suggest public domain solutions that have helped them. These recommendations are helpful—even in the world of free software, "caveat emptor" is good advice.

Back into the SHELL

Several readers lambasted me for recommending the use of the undocumented SHELL command with DOS 2.0 and BASICA (see "Batch Files in the SHELL," PC, Volume 3 Number 9, page 432). I must apologize: in DOS 2.0, there's a fatal bug that haunts you when you try to perform disk operations after calling the SHELL command.

In DOS 2.1, however, the bug has been fixed, and SHELL is now working and documented in that version of the operating system.

Printing a BASIC Run

Q: I often find it desirable to print out the "run" of a session when I use a BASIC program. On a Apple computer I can do this by typing PR #1, and I can do it on the IBM PC while in PC-DOS by pressing Ctrl-PrtSc. I have not found a method, however, that allows me to print out a run while in BASIC on the PC. Is there a method that would let me do this without leaving BASIC?

Todd Milne
Niantic, Connecticut

A: There are two ways to do it. By far the easiest approach is to purchase PC-DOS 2.0, since the updated operating system has fixed that particular problem. With PC-DOS 2.0 you can push Ctrl-PrtSc while in BASIC and have the run of the session echoed to the printer.

If you're reluctant to spend \$60 to fix this bug, you could change all PRINT statements to LPRINT statements. You can do this easily if you have a text editor. Just

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save your BASIC program as an ASCII text file by entering a statement like

```
SAVE "MYPROG", A.
```

Then use your text editor's search-and-replace feature to change all occurrences of PRINT to LPRINT. If you use PRINT # statements to write to files, however, make sure PRINT isn't changed to LPRINT in these statements.

Fitting GRAPHICS into APL

Q: I do most of my programming in IBM's APL on a 128K IBM PC. To do graphics, I use the BIOS/DOS Auxiliary Processor (AP100). I'd like to use the GRAPHICS program in PC-DOS 2.0 to send graphics I create to my IBM Graphics Printer.

I haven't been able to do this because, apparently, some portion of APL or an auxiliary processor tries to use the same area in memory as the GRAPHICS program. Is there any way that I can use this program in conjunction with APL?

Roy W. Sommers
Pennsville, New Jersey

A: It's more likely that the APL code is overlaying the Keyboard or Print Screen interrupts in memory, rather than overlaying the GRAPHICS program. In either case, after you load GRAPHICS and tap the *PrtSc* key, the net result is a printout with regular *PrtSc* characters rather than the superior screen graphics.

To invoke the GRAPHICS program while within APL, you must write a simple auxiliary processor (AP) that you can call, which then calls the GRAPHICS program.

In the following example, I assumed that APL had overlayed the Keyboard interrupt (INT 16h) but not the Print Screen interrupt (INT 5). In this case, an assembly language routine that calls GRAPHICS is:

```
PUSH BP
INT 5
POP BP
```

(This routine can be found on page 6-106 in IBM's DOS 2.0 manual.)

In the other case, where the APL code overlays the Print Screen interrupt in memory, another simple kludge can make the GRAPHICS program work. After you load GRAPHICS, run DEBUG and examine address 0000:0014. This will give you four bytes—an address that shows where GRAPHICS was loaded. Here's an example of what you might enter at the keyboard and read on the screen:

```
A>DEBUG
-D0:14
0000:0014 20 03 56 06
-Q
```

You find the address of the Print Screen interrupt by reading those four hexadecimal values backwards. In the above example, the actual address is 0656:0320. If that was the address you found, you could write this code to call GRAPHICS:

```
PUSH BP
PUSHF
CALL 0656:0320
POP BP
```

Keep in mind that the exact address where GRAPHICS is loaded depends on a variety of factors, including the number of disk buffers and what has been done with the *MODE* command. Don't include a routine like the one above in a piece of commercial software since the address for GRAPHICS will vary for different users.

Color Defeated

Q: I use the PeachText 5000 package for most of my work, and I can't for the life of me figure out how to make it display anything but a drab white-on-black screen on my RGB color monitor. I'm not after anything fancy—a different foreground color would satisfy me. I can call up color displays from BASIC or with a public domain program that's similar to routines in *PC Magazine's* ANSI.SYS articles (see the programming columns in *PC*, Volume 3 Numbers 7 and 8). But no matter how I call for color, every time I access Peach-

Text 5000, the screen immediately reverts to white-on-black.

Is there some way to use ANSI.SYS to put color into PeachText? Or, if prompts to set color can't work with that program, should I assume that key reassignments won't work either?

David Glasser
Arlington, Virginia

A: Although the ANSI.SYS device driver added a large number of capabilities to DOS 2.0, most commercial software packages, including PeachText 5000,

I can't for the life of me figure out how to make my PeachText 5000 package display anything but a drab white-on-black screen on my RGB color monitor.

completely ignore this device driver.

Programs for word processing, spreadsheets, and communications need to perform keyboard and screen operations as quickly as possible. To meet this requirement, for input and output (I/O), most of these programs bypass DOS entirely and handle I/O through the BIOS instead. (BIOS stands for Basic Input/Output System—the word Basic here doesn't refer to the programming language.)

The BIOS is a lower level of system software than the DOS; using DOS insulates the programmer and user further from the hardware. Generally, "the more insulation the better" is a good rule for writing software for the IBM PC, since many PC-compatibles are compatible only at the higher MS-DOS level. Pro-



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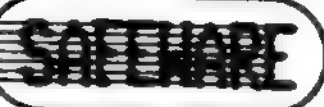
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PC TUTOR

grams that work exclusively through the DOS can run on a larger range of machines than programs that call on the BIOS or—even worse—that manipulate a particular computer's hardware directly.

There's a speed penalty, however, when a program works through the DOS; you lose a fair amount of versatility as well. Word processors, in particular, would slow down drastically if they used DOS and ANSI.SYS to write text to the screen—so much slower that almost no word processors go through DOS to handle screen output. Communications programs that relied completely on DOS would be limited to 300 baud.

This means that PeachText 5000 is just one of many programs that ignore ANSI.SYS. If such a package offers no built-in way to select screen colors, there's nothing you can do.

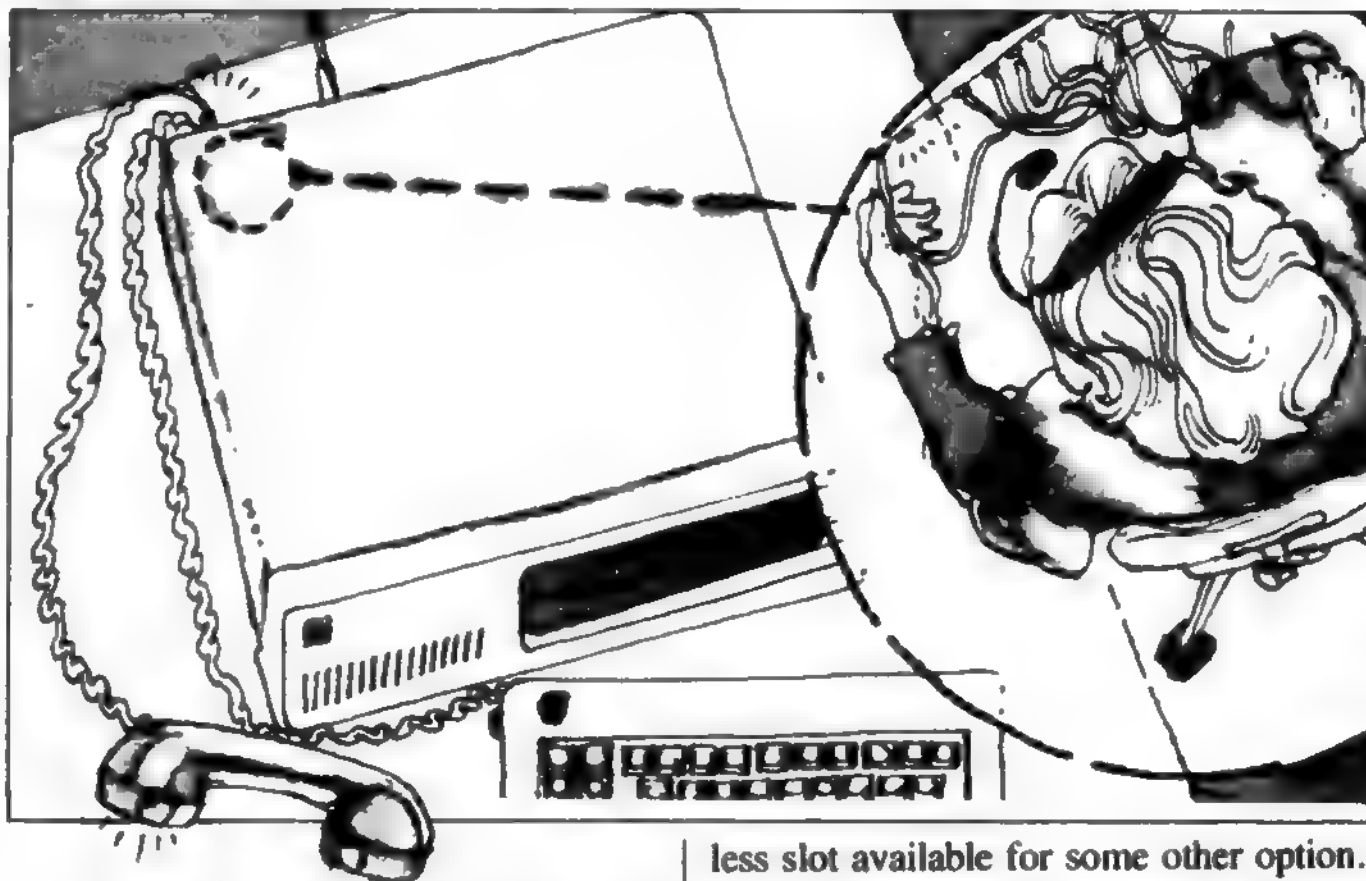
The keyboard input situation is a bit different. Going directly to the BIOS for keyboard operations gives only a slight increase of speed. The main advantage here in bypassing DOS is to escape some unfortunate side effects of the DOS keyboard calls. Early versions of DOS were unable to recognize some 2-byte keycodes; this has been solved in later versions of DOS, but the problem lingers on in language compilers that were designed to work around the old operating system's quirks. Another problem is that pressing Ctrl-C will often stop a program dead; on the IBM PC you can get the same effect by pressing Ctrl-Break—a key combination that you're less likely to strike unintentionally.

Some of these problems exist because DOS was designed to be a CP/M-80 workalike. Now, we'd be better off without these "features."

The PC Tutor solves practical problems and explains points of general interest to users of the IBM Personal Computer. If you'd like to see your questions answered in this column, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016.

Board Modems: The Inside Story

The board modems reviewed here can do everything their standalone cousins can. In addition, they cost less, and they come bundled with communications software.



There are two basic types of modems—standalone modems and board modems—and they have a lot in common. Both make it possible for computers to communicate over phone lines, both have combination 103/212 compatibility (which allows for communication at either 300 or 1200 baud), and both have good points and bad points.

The most obvious advantage of board modems can also be a disadvantage, depending on your point of view. A board modem goes inside your PC. As an advantage, this means one less box cluttering up your desk and one less cable to worry about. As a disadvantage, it means one

less slot available for some other option.

One unarguable advantage of board modems is price. The standalone version of the Hayes Smartmodem 1200 lists for \$699. The board version lists for \$599. And not only does the board version immediately save you \$100, but Hayes also throws in *Smartcom II*, a sophisticated communications program that lists for \$149 if you buy it separately.

The main reason that board modems are cheaper than standalone modems is that they have fewer parts. They don't need a separate box or power supply, and, because they reside inside the computer, there is no point in putting a bank of status lights on them. This leads directly to one

of their disadvantages—namely, if you are accustomed to status lights, you probably depend on them more than you realize and may miss having them.

What this all boils down to is that there is no obvious choice between board modems and standalone modems. Both will do exactly the same job for you, and most manufacturers will happily sell you either kind. I discussed several standalone modems in a previous column (see "Top of the Line Standalone Modems," *PC*, Volume 3 Number 12). Here's a look at four modems-on-a-board.

Hayes 1200B

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Aside from the lack of status lights, the 1200B shares all the features and capabilities of the Smartmodem 1200. As with the 1200, the 1200B has 19 basic commands and about as many registers. These let you control such arcane things as how long to wait for a dial tone in auto-dial mode. Also, like the standalone version, the 1200B has five modes of operation—manual originate, manual answer, auto-

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dial, auto-answer, and reverse auto-dial, in which the modem will dial and then go into answer mode. Another feature on the 1200B is a second jack to plug your phone into.

Because the 1200B has the same set of commands as the 1200, you can use it with any communication program designed to work with the standalone Smartmodem. If you buy the 1200B, Hayes will also throw in its own program, *Smartcom II*, free of charge. *Smartcom II* lets you control the modem through menu choices.

The 1200B comes with two manuals: a hacker-oriented hardware manual, and a user-oriented software manual. If you're more user than hacker, the trick is to read just enough of the hardware manual to get the modem plugged in and working. Then switch to the software manual, which is not only more readable, but also contains a reasonably thorough introduction to the entire field of communications.

Smartcom II requires a minimum of 96K RAM. Older 1200Bs used up two slots in the PC-XT because of the closer slots in the XT. Hayes tells me that the speaker is now slimmer and the board will use only one slot.

Microcom, Inc.
1400A Providence Hwy.
Norwood, MA 02062
(617) 762-9310

List Price: \$499

Requires: 128K RAM and DOS 2.x (for Era 2 software).

CIRCLE 792 ON READER SERVICE CARD

This is my current favorite among board models because the Microcom Era 2 package is equivalent to the Hayes 1200B and costs \$100 less.

Functionally, the Era 2 modem is virtually identical to the Hayes Smartmodem. The set of commands, the double handful of registers, and the operating modes are all the same. The early version of the modem missed being Hayes-compatible by just enough so that it would not work with Hayes' *Smartcom II*. Micro-

com tells me that this has been corrected and that the Era 2 boards are now completely Hayes-compatible.

As with the 1200B, Era 2 comes with a reasonably sophisticated communications program, also named Era 2. The design of the Era 2 program is significantly different from the *Smartcom II* design, but the capabilities are fundamentally the same.

And Microcom goes Hayes one better in providing a single, integrated manual that tells you everything you need to know about the hardware, the software, and communications. Not only is the information all in one place, but it's presented pretty much in the order you'll probably want to see it.

(For a closer look at the Era 2 package, see "A New Era in Communications," *PC*, Volume 3 Number 8.)

Bizcomp Corporation
532 Weddell Dr.
Sunnyvale, CA 94086
(408) 745-1616

List Price: \$499

Requires: 64K RAM and disk BASIC
(for PC: IntelliCom software).

CIRCLE 791 ON READER SERVICE CARD

Very much in the same class with the Smartmodem 1200B and Era 2 packages, the PC:IntelliModem also comes with its own communications program: PC:IntelliCom. Bizcomp's software is written in BASIC and is less sophisticated than Era 2 and *Smartcom II*, but it contains standard amenities such as auto-dial, auto-log-on, and the ability to transfer files directly to and from disk. A nice feature of the PC:IntelliCom program is that it makes it easy to toggle the modem on and off. This allows you to switch between voice communications and computer communications without accidentally hanging up the phone.

The PC: IntelliModem's features are similar to those of the Hayes and Era 2 modems. It even has a "Hayes mode" in which it will obey many of the Hayes Smartmodem commands. But it still is not completely compatible with the Hayes, so

any given program for the Smartmodem may or may not work with the PC: Intelli-Modem. *Smartcom II* seems not to work at all, although *Crosstalk XVI*, another Hayes program, seems to work fine.

A second drawback of the PC: Intelli-Modem is its manual. While it is reasonably well written, it assumes a fair amount of knowledge about communications. If you don't have the background, you may have to work a bit to get through it.

Rixon

PC212A

Rixon Inc.

2120 Industrial Pkwy.

Silver Spring, MD 20904

(301) 622-2121

List Price: \$499; with additional Comm 2 port connector, \$539.

Requires: DOS 2.0

CIRCLE 790 ON READER SERVICE CARD

As with the Bizcomp modem, the Rixon PC212A has both its own set of commands and a "Hayes mode" in which it obeys most, though not all, Hayes commands. According to Rixon's ads, the PC212A is compatible with "all of the programs written for the Hayes Smartmodem." I found I could make it work with *Crosstalk XVI*, but not with *Smartcom II*. The Rixon PC212A comes with an extremely minimal communications program, lacking any provision for incoming information and saving it to disk. You will quickly outgrow it.

One nice thing about the Rixon modem is that you can get it with an optional asynchronous serial port. This means that your serial printer, for example, can plug into the Rixon modem card and save a slot.

The Rixon manual, like the Bizcomp manual, assumes a fair amount of knowledge about communications. Hackers will be delighted, however, by the wealth of technical information they'll find in it.

This should give you a sense of what's available, and a good start if you're looking for a 103/212-compatible board modem. In a future issue, we'll take a look at a group of 103-compatible modems. ■

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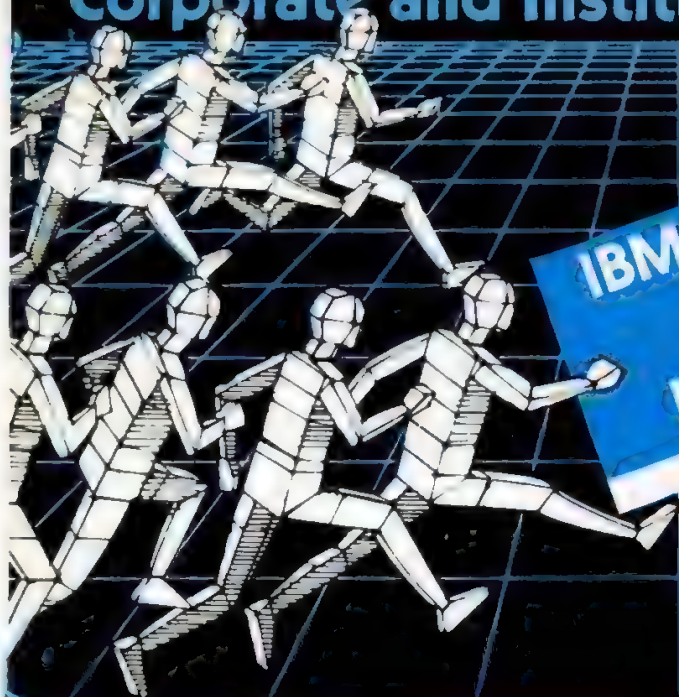
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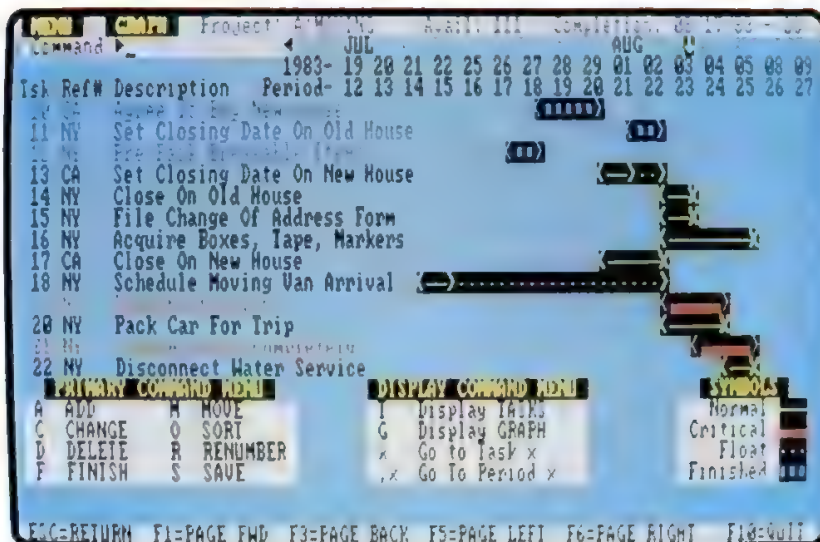
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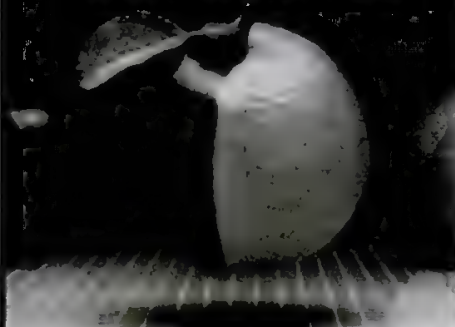
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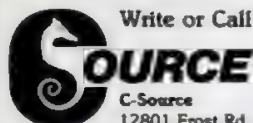
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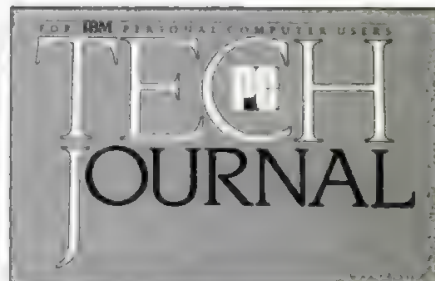
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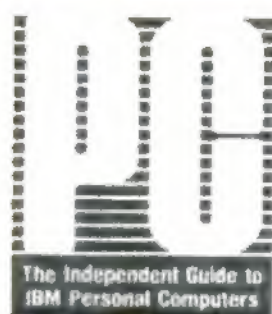
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Word Processing Roundup

PC will rustle up 19 of the most popular word processors and put them through their paces. We'll compare the packages function by function and chart how each is carried out. In addition, our authors will offer their personal views on the effectiveness of the word processors. The objective: to allow you to choose the word processing package that best suits your needs.

Attaché Accounting Software

Price Waterhouse examines an accounting software package from Attaché Software, Inc., an Australian firm making its debut in the U.S. market. An aggressive marketing plan for this software includes setting up regional training centers for consultants, as well as "hot-line" technical support to consultants and dealers. The question is, does your company need this support for its accounting software?

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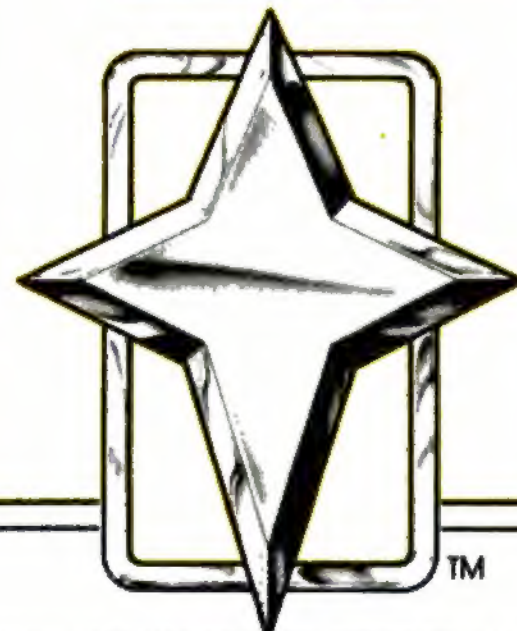
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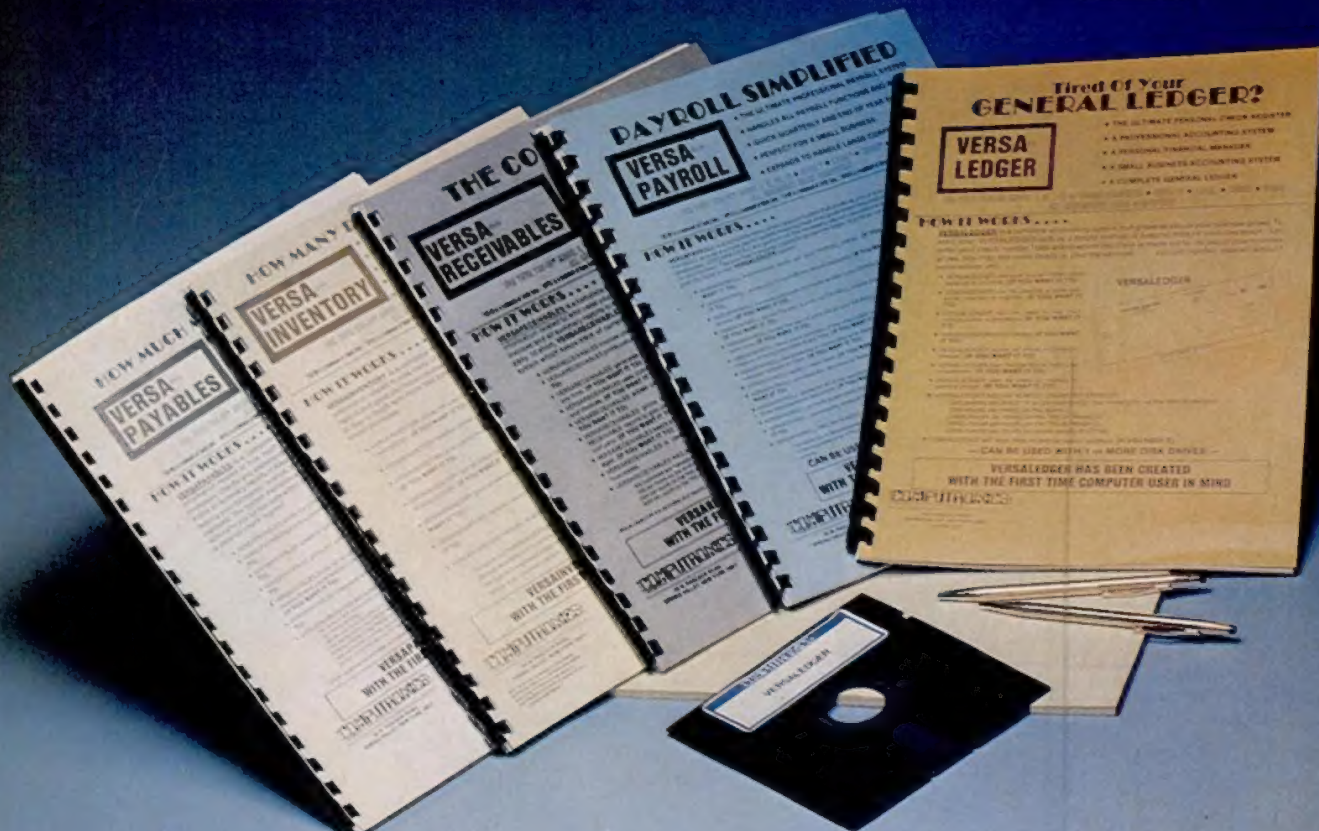
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